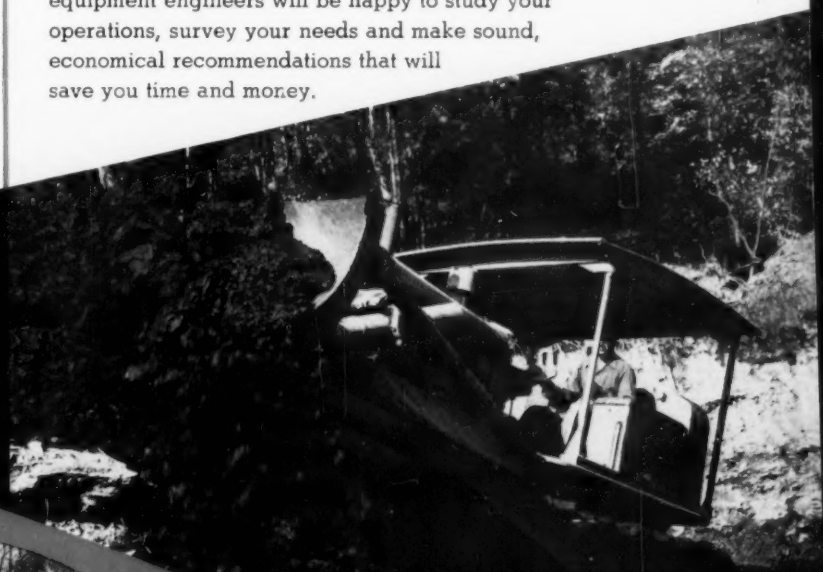
COAL MINING

May, 1956 Volume 33, No. 5

WHY BE SATISFIED?

. . . yes, why be satisfied with less than the best in mining equipment?

Especially, when Highway's trained, experienced equipment engineers will be happy to study your operations, survey your needs and make sound, economical recommendations that will save you time and money.



Allis-Chalmers HD-16 at COOPERWAITE & JONES COAL CO., La Jose.

Lima 802 stripping overburden for McINTIRE COAL CO., Brockway.

Highway EQUIPMENT COMPANY

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Power-Pack Conveyors •
Gar Wood • Erie Bins
Michigan Tractor Shov
Lima Shovels, Cranes, Draglines

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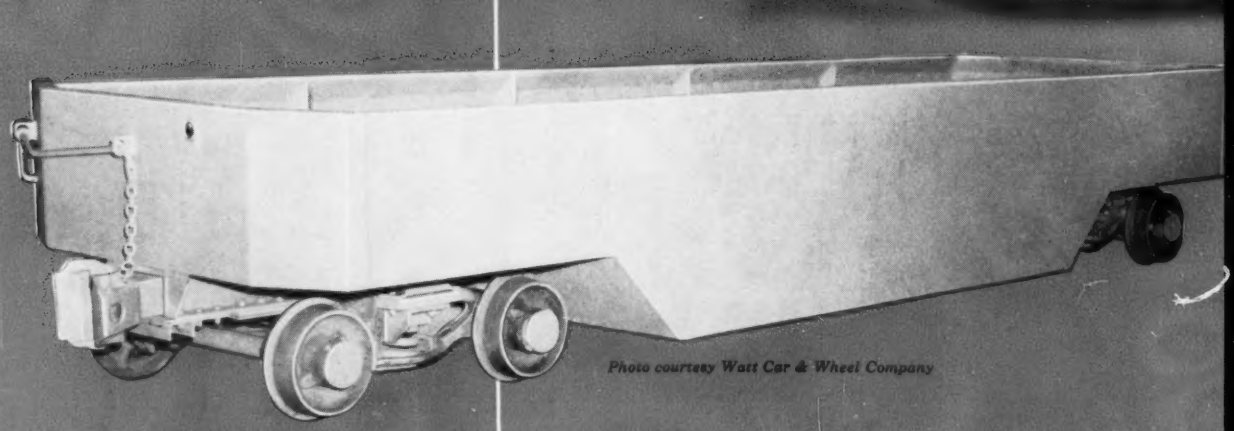


Photo courtesy Watt Car & Wheel Company

Barnes and Tucker Company continues to specify

NATIONAL

equipment for all 8-wheel mine cars

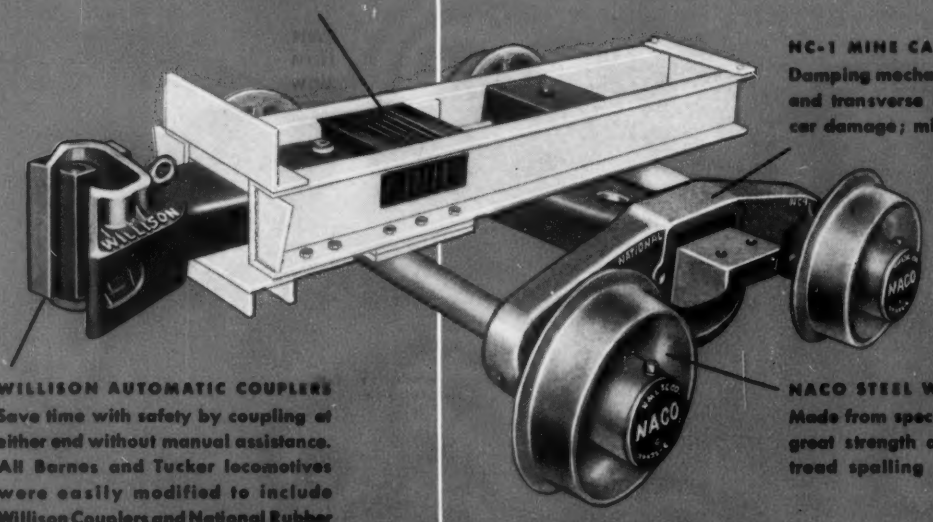
On its latest order for 100 eight-wheel Watt mine cars, Barnes and Tucker Company's Lancashire No. 15 Mine specified National equipment *throughout*. This includes National NC-1 trucks, Naco Steel Wheels, Willison Automatic Couplers, and National Rubber Cushioning devices.

This latest re-order makes—*and keeps*—the entire fleet of rotary-dump cars *100 percent National equipped*. And this means that the Barnes and Tucker Mine has one of the most modern fleets of mine cars in existence. *Modern* because the cars are safe to operate at high speeds . . . *modern* because they are efficient and minimize spillage . . . *modern* because they will continue to keep maintenance costs low.

Think of tomorrow today . . .
and modernize your cars the National way.

NATIONAL
MALLEABLE and STEEL **CASTINGS COMPANY**
Cleveland 6, Ohio

NATIONAL MI-230
All National Rubber Cushioning devices provide soft initial action, high absorption, and maximum protection.

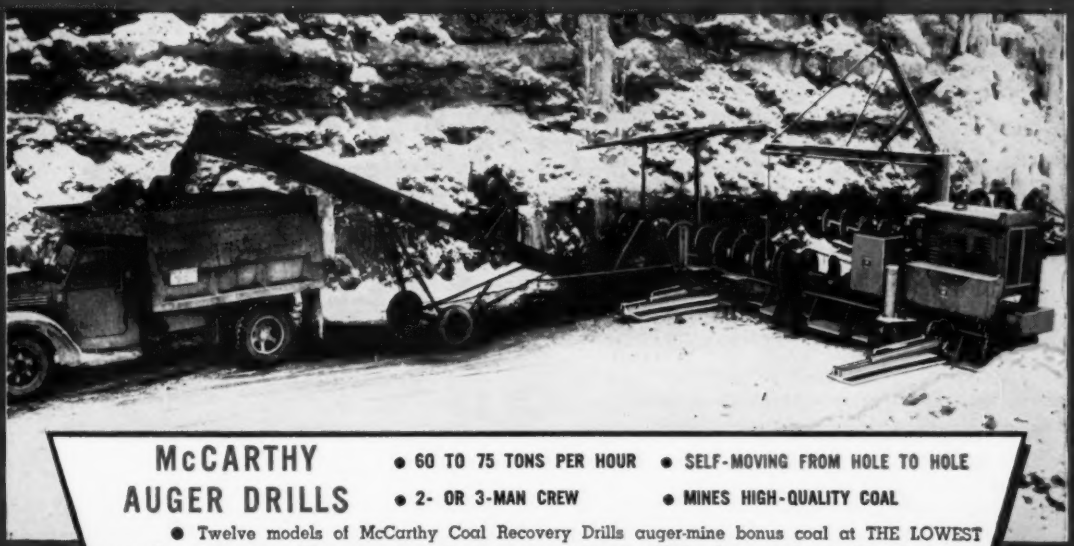


NC-1 MINE CAR TRUCK
Damping mechanism controls vertical and transverse oscillations; reduces car damage; minimizes spillage.

WILLISON AUTOMATIC COUPLERS
Save time with safety by coupling at either end without manual assistance. All Barnes and Tucker locomotives were easily modified to include Willison Couplers and National Rubber Cushioning devices.

NACO STEEL WHEELS
Made from special Naco cast steel of great strength and ductility; reduce tread spalling or flange breakage.

AA-3781



McCARTHY AUGER DRILLS

- 60 TO 75 TONS PER HOUR
- SELF-MOVING FROM HOLE TO HOLE
- 2- OR 3-MAN CREW
- MINES HIGH-QUALITY COAL

● Twelve models of McCarthy Coal Recovery Drills auger-mine bonus coal at THE LOWEST operating cost per ton. They operate easily in narrow strip pits. Hydraulic controls simplify alignment, augering and changing position. Let us recommend the right cost-saving model for your property. Write for Bulletin M-101 and M-102.

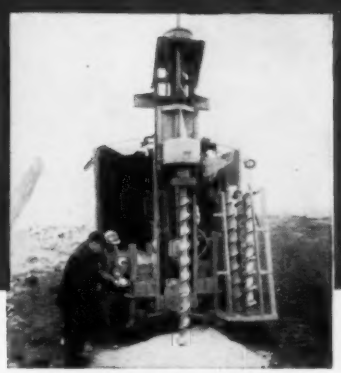
SELF-PROPELLED

Horizontal Earth and Rock Boring Auger Drills 150 ft. Drilling Depth

● The self-propelled unit permits speedy, economical blast-hole drilling from hole to hole. It takes just a few seconds to disengage the power unit from the auger drive shaft, change position, and begin drilling again. The unit is easily attached to the McCarthy truck-mounted earth and rock boring drills now in use.

TRUCK-MOUNTED

● Truck-mounted horizontal drills are highly versatile. The drilling unit mounts lengthwise or crosswise on the truck bed for spotting hole locations faster. Drilling height from the ground ranges from 4½ to 7 ft. Four separately operated levelling jacks permit close alignment. Write for Bulletin M-105.



HEAVY-DUTY VERTICAL

Model 106-24—World's Fastest Heavy-Duty Vertical Auger Drill

● Bores vertical blast holes faster than any other auger drill. New gear reduction permits slower auger rotation for drilling larger holes deeper in harder rock formations. Augers 8" and 9" dia. drill holes to depths of 125 ft. for use of new type explosives. Controls can be placed at rear and auger racks can be furnished if desired. Write for Bulletin M-100.

FINGER-TIP CONTROL

HEAVY

Gives Desired Rotating Speed Of Auger

RUGGED

HYDRAULIC FEED

Provides Any Speed Up To 6 Feet Per Minute Horizontal Feed Of Drill

POWERFUL

THE SALEM TOOL COMPANY

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SALEM

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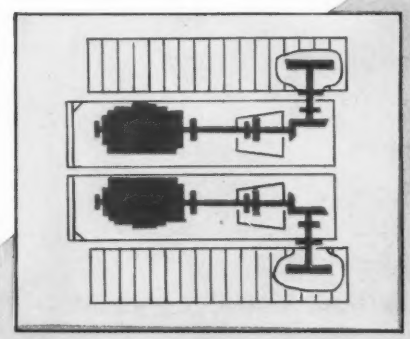
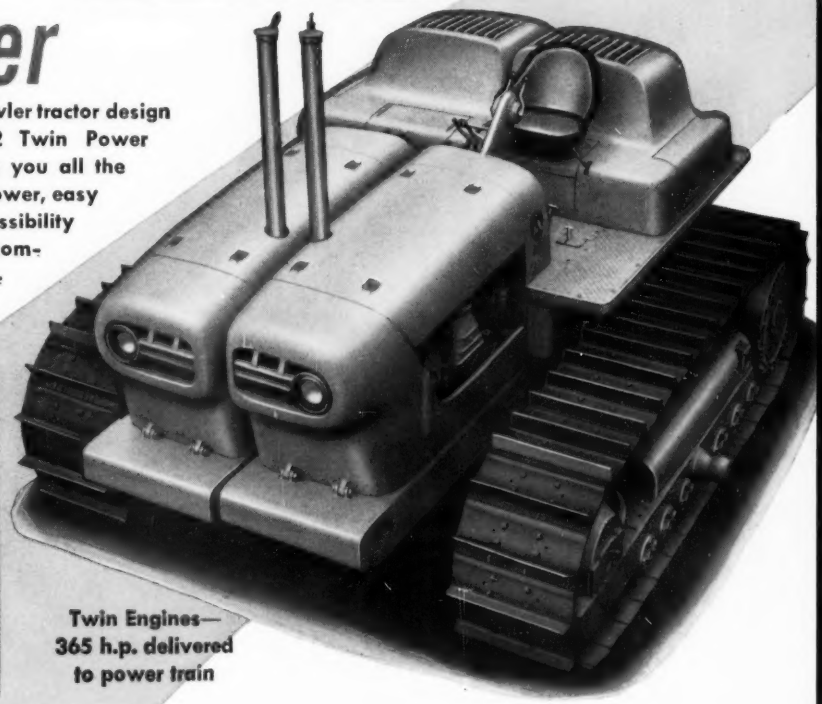
Biggest Tractor News in Years...

the "Euc" TC-12 Twin Crawler

Here's a completely new concept of crawler tractor design and performance . . . the new TC-12 Twin Power Euclid. It's designed and built to give you all the features you want in a tractor—more power, easy operation, greater workability and accessibility for servicing . . . and all power train components are matched, with years of application in earth moving equipment.





Twin Engines—365 h.p. delivered to power train

SPECIFICATIONS

total h.p.—388 h.p. at rated speed	
available for tractive effort—365 h.p.	
speeds—3 speed ranges forward and reverse to 8.3 mph	
drawbar pull (bare tractor)—forward and reverse	54,000 lbs. low range 53,500 lbs. intermediate 53,000 lbs. high range
track width (standard shoe)	26"
track gauge	110"
overall width	11' 4"
overall length	16' 2"
height (excluding stacks)	7' 11"
drawbar height	23"
ground clearance	20"
operating weight (bare)	approx. 58,000 lbs.

Powered by two diesels with separate Torqmatic Drives for each track, the TC-12 has 365 h.p. available for tractive effort—a smooth steady flow of power to meet any job requirement. There's no master clutch and no manual gear shifting . . . the operator simply moves a lever to select one of three speed ranges—forward and reverse—for travel speeds up to 8.3 m.p.h. Maximum drawbar pull is equal to, or greater than, the weight of the tractor and any attachments.

Each half of the tractor is separate and free to oscillate on a single transverse shaft. This gives the TC-12 maximum stability and traction on rough ground. The tractor can be easily separated into two halves for shipment when necessary.

Never before so much workability!

EUCLID DIVISION GENERAL MOTORS CORPORATION, **Cleveland 17, Ohio**

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

COAL MINING

Vol. XXXIII May, 1956 No. 5

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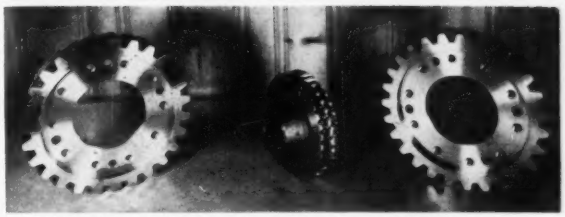

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Most widely used communication for underground haulage.

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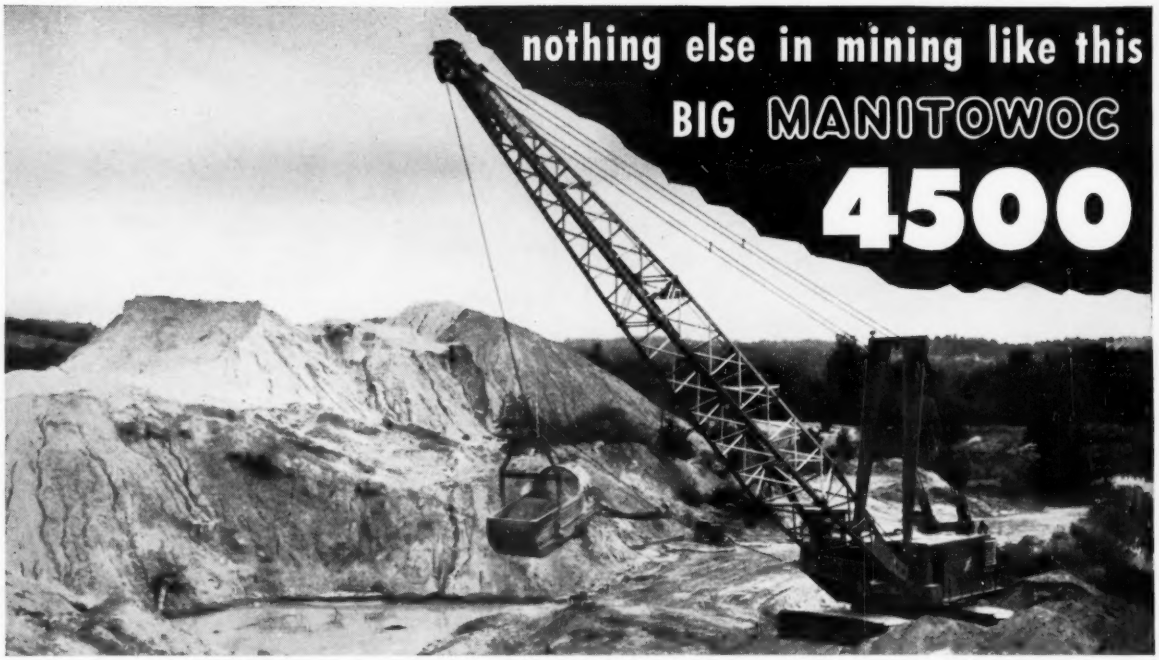
Finest communication between control points in cleaning plants.

CONTROLS
Save time and money by remote control of pumps, fans, sub-stations, etc.

Femco systems were first in the mines and are today first in quality and dependability.
Get the facts. Submit your problem for a proposal.



Little downtime with great capacity is the record set by this 4500 dragline mining limonite ore for U. S. Pipe and Foundry Company near Russellville, Ala.

There's no place for undersized, underpowered mining machines when you're aiming for more production per man hour. That's why the husky Manitowoc 4500 is today's "greater output" champ among mining operators.

United States Pipe and Foundry Company of Birmingham, Ala., use two 4500 draglines equipped with 140′ booms and 4 yd. buckets for mining limonite ore. Satisfactory performance from three Manitowoc 2-yd. shovels led to their choice of the larger 4500 machines. Top capacity with little downtime for all five units, is due to Manitowoc's simple design and superior construction.

TOP DESIGN FEATURES MAKE A TRUE MINING MACHINE

GREATER SIMPLICITY OF DESIGN directs more power to the dipper or bucket. Only four main shafts — only 15 gears — only working gears turn.

GAS OR DIESEL UNIT DRIVE effectively utilizes power — eliminates thousands of electrical wires and components. Full power can be applied to any operating function with less dead weight than is found in electric machines. Greater mobility — no restrictive electrical cables.

EXCEPTIONAL STABILITY assures top capacity. Massive carbody, adequate counterweight and long, wide crawlers let you reach way out with full safety and low ground bearing pressures.

SPECIAL HI-LIFT SHOVEL BOOMS available in two lengths — 60′ boom with 45′ tubular stick and 50′ boom with 37′ stick.

POWER-SMOOTH TORQUE CONVERTER, pioneered in power shovel application by Manitowoc, multiplies engine torque three times. Efficiency is increased and engine life extended. With engine power balanced to the load, engine **cannot stall — cannot be overloaded.** Make the Manitowoc 4500 your next mining machine. Send today for your **free** copy of the new 20 page Model 4500 illustrated catalog — no obligation!

Air-operated controls and clear, unobstructed view from large comfortable cab help 4500 operator do a better job.

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MANITOWOC ENGINEERING CORP.
Manitowoc, Wis.

BIG POWER

cuts costs on

BIG JOBS

YOUR
CATERPILLAR
DEALER
presents

***BIG* CAT D9 TRACTOR**

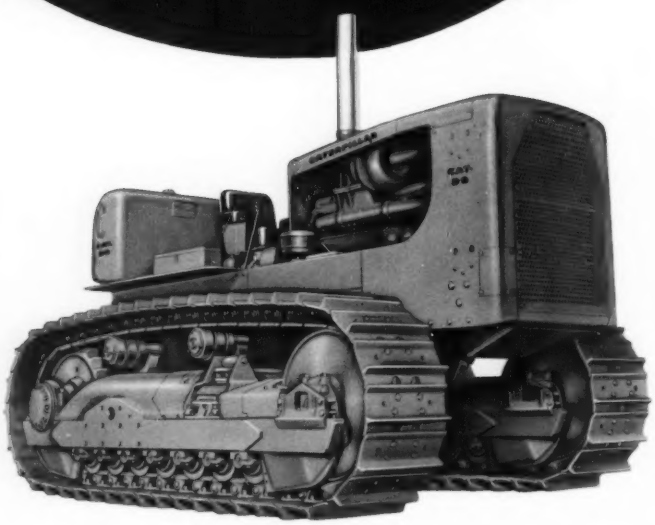
***BIG* CAT No. 90 SCRAPER**

***BIG* NEW CAT ENGINES**

YOUR CATERPILLAR DEALER WILL SHOW YOU BIG POWER EARNINGS!

BIG JOBS prove CAT* D9 Tractor profit-making performance

BIG D9 proved on 'dozer work



Here's the tractor that's making big headlines—'dozing, clearing, pushing and pulling scrapers at a rate of production and profit never before equalled. Yes, the mighty D9 is outworking all competitors—yet it's cutting operating and maintenance costs thanks to . . . (1) the economy of its Cat Diesel Engine . . . (2) power-boosting efficiency of a Turbocharger . . . (3) unit design to speed service work by facilitating easy removal of many major components without disturbing adjacent units. The D9 is also boosting operator efficiency. Steering clutches and air-cooled steering brakes are hydraulically boosted to eliminate most of the work. Adjustable, foam rubber seat provides maximum comfort.

Make production headlines on your big jobs, too. Plan now to stop in and see the D9, or call us for a demonstration.

CATERPILLAR*

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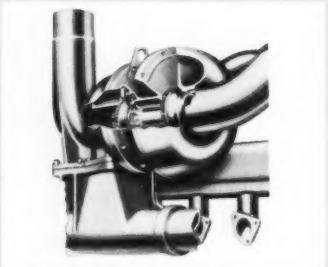
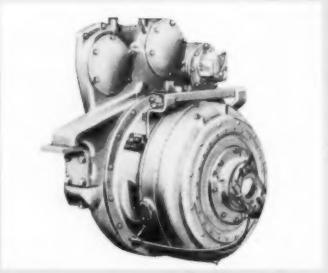


WORK POWER FROM WASTE POWER!

Driven by exhaust gas energy ordinarily wasted, the powerful D9 Turbocharger increases engine HP over 50%, improves engine response to load changes. Efficient air cleaner filters incoming air in a bath of oil to keep air-borne dust and dirt out of precision-made engine parts.



TWO GREAT POWER TRAINS!

Cat D9 Tractor is available with the new heavy-duty torque converter (above), or with the exclusive Cat oil clutch. Three-stage D9 torque converter multiplies torque five times, instantly adjusts to load changes. Oil clutch reduces friction, provides longer life, fewer adjustments.

CAT D9 TRACTOR BRIEF SPECIFICATIONS
(SERIES D)

Engine—Four-stroke cycle, valve-in-head, 6-cylinder diesel, Turbocharged. (Rated at sea level.):

Engine HP at flywheel	286
Drawbar HP (direct drive)	230
Bore and stroke	6¼" x 8"

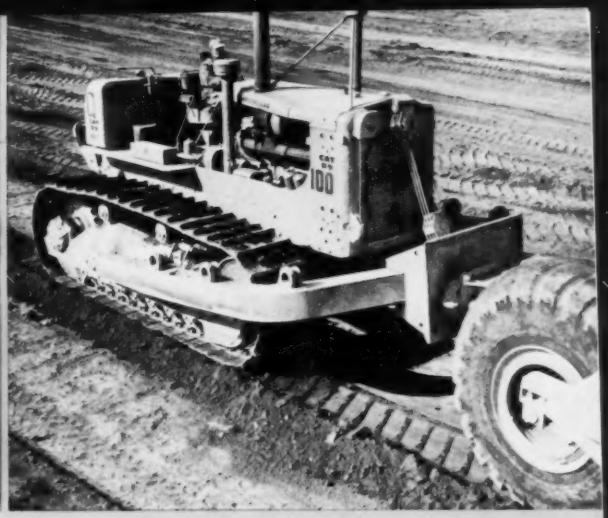
Weight:

Direct drive, operating weight, lb.	58,725
Torque converter drive, operating weight, lb.	58,745

Starting Method:

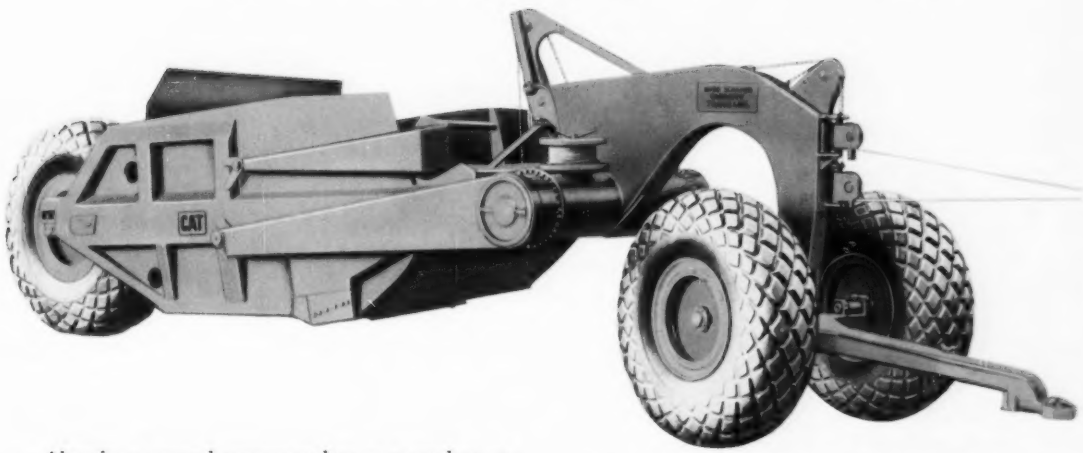
In-seat starting with independent gasoline engine. 6-volt electric starter for starting engine.

BIG D9 proved on clearing work



BIG D9 proved on pusher work

match big D9 power with big NO. 90 SCRAPER profit-making capacity!



Already a proved money-maker as a pusher or bulldozer, the mighty D9 is setting new production records pulling the big Cat No. 90 Scraper. Designed in weight and capacity to match the great power and traction of the D9, the No. 90 offers struck capacity of 21.2 cu. yd. and heaped capacity of 27 cu. yd. Scraper apron opening is a big 5′ 10″ to permit the fast and easy entrance and discharge of heavy, chunky material. Positive type, cable controlled, 'dozer-type ejector extends well over top of sides, sweeps bowl clean of sticky material. For your up-coming big jobs, be sure to consider the profit-making opportunities of the Cat D9 Tractor–No. 90 Scraper team. Your Caterpillar Dealer will be glad to tell you more about it.

The best place to buy Construction Equipment!

YOUR

CATERPILLAR

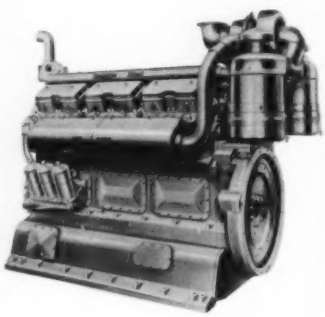
DEALERS

BIG, NEW CAT ENGINES

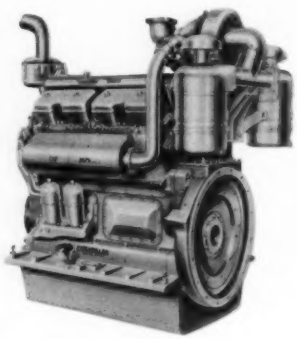
FOR YOUR EQUIPMENT FLEET

Your Caterpillar Dealer announces two new Cat Engines for big, full time power in new machines or as efficient, economical, replacement power in your present excavators, crushers, asphalt plants and dredges. With Cat generators, the two engines, the D397 and D375 (Series D), are also available as Cat Diesel Electric Sets for electrically driven machines or as Cat Diesel Mobile Electric Units to operate anywhere. Each engine is available in three different types—Turbocharged, Roots Blown and Naturally Aspirated. The new D397, most powerful engine ever developed by Caterpillar, and the D375, in the Turbocharged versions, produce more power per gallon of fuel, give you a greater margin of profit than the previous engines bearing these numbers.

D397—650 HP



D375—430 HP



HP SPECIFICATIONS

		MAXIMUM OUTPUT CAPACITY	INTERMITTENT HP	CONTINUOUS HP
D397	Turbocharged:	650	575	500
	Roots Blown:	—	520	450
	Naturally Aspirated:	—	415	360
D375	Turbocharged:	430	375	325
	Roots Blown:	—	350	302
	Naturally Aspirated:	—	275	238

Whatever your power needs . . . look to Cat Diesel Tractors and Cat Diesel Engines! As your Caterpillar Dealers we can carefully analyze your needs and recommend the Cat equipment for you that will bring you the biggest return on your investment. Make it a point to see us soon. Our names are listed at the right.

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Do You Know?

• For $200,000,000 in national scholarships, the most talented entering college could be doubled. Three-quarters instead of the present half of the brightest or top quarter of high school graduates could be persuaded to enter college.

This would be a major step toward the continued national development and security of America, an American Council on Education study by Dr. Elmer D. West, issued recently recommends.

The many students who are very capable who do not attend college is a serious national problem, the study shows.

The amount of money available for scholarships now is variously estimated as from $30,000,000 to $55,000,000 annually.

Dr. West urged:

1. Identify the talented no matter where they are located. Do not leave this to chance.

2. Inspire the talented to want the maximum intellectual development possible.

3. Implement the aspirations developed by providing scholarships.

Dr. West found that a higher percentage of high school graduates attend college from high income homes than middle and lower economic levels. More boys than girls go on to college. Those whose parents are in professions are more likely to attend college.

• The output of a small work group depends on the make-up of the group rather than on the individual characteristics of the members. And this applies to such very different groups as a nine-man infantry rifle squad in the Army and a six-man work group in a factory, as revealed in reports to the Eastern Psychological Association.

The study of Army rifle squads was reported by Drs. M. Dean Havron and William A. Lybrand of Psychological Research Associates, Washington, D. C.

The success of a rifle squad in combat is not to be attributed to the individual scores of members in rifle practice. What is important is the ability and personality of the squad leader and his knowledge of the squad and the individual characteristics of members. Confidence of the men that their leader adequately fills the role expected of him is also important in predicting what the squad will do when they go into battle.

What is important in determining the work output of an industrial group is whether the group is tight-knit and cohesive enough to be properly called a group. Personality characteristics of individuals in the group and their satisfaction with the job did not turn out to be important in affecting the speed of work.

This study was reported by Dr. Elliott R. Danzig of the Institute for Research in Human Relations, Philadelphia, and Dr. Eugene H. Galanter of Harvard University.

Here and There in the Coal Industry

Anthony Sossong, left, University of Pittsburgh student, accepts a gold watch from L. C. Campbell, vice president of Eastern Gas and Fuel Associates and president of the National Coal Association. Sossong was named an outstanding senior student in coal mining engineering by the Old Timers Club, which each year presents similar awards to students at various universities.

THE JOHNSTOWN COAL & COKE COMPANY, Johnstown, Pa. has purchased the Williams River Mine of the Gauley Mountain Coal Company in Webster County, West Virginia. The Mine will be renamed the Crichton Number 15 and improvements will be made to increase the production to 1,500 tons per day of metallurgical coal.

R. L. IRELAND, chairman of the executive committee of Pittsburgh Consolidation Coal Company received the Erskine Ramsey Gold Medal for 1956, at the annual banquet of the American Institute of Mining and Metallurgical Engineers, in New York.

The award was offered "For his vision, energy, and consistent, courageous belief in and leadership of the American coal industry."

Mr. Ireland has been associated with the coal industry since 1920 when he entered the mining engineering department of a subsidiary of The M. A. Hanna Company. He was employed by the Hanna Coal Company in 1924, rising through the ranks to president in 1931.

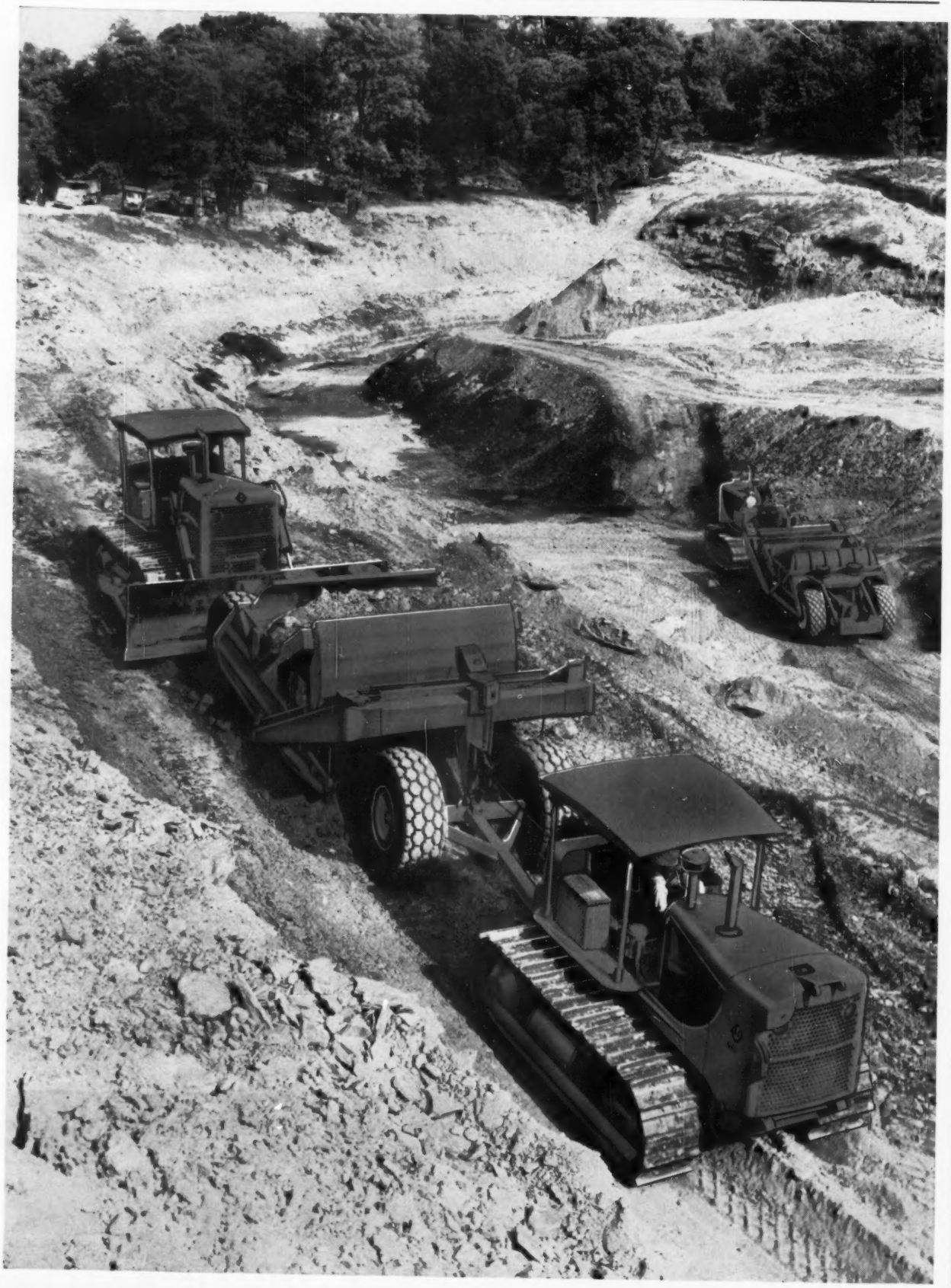
In addition to his position with Pittsburgh Consolidation Coal Company, he is chairman of the executive committee and director of The M. A. Hanna Company of Cleveland. He holds directorships in other companies, including Phelps Dodge Corporation, National Steel Corporation, and Union Bank of Commerce.

Mr. Ireland who was born in Cleveland in 1895, is married and has a daughter and three sons.

Martin L. Garvey, 74, long connected with the West Virginia and Virginia coal industry and former president and general manager of several coal companies, died at 10:30 A. M. Thursday, March 22, 1956, at Georgetown University Hospital, after an illness of several weeks. He handled all phases of mine operations as well as labor matters, and for two decades was an executive of Pocahontas Fuel Co.

SALEM "HERCULES" AUGERS FOR ELECTRIC DRILLS
Made To Withstand High Drilling Speed, Whip And Torsional Strain Of Electric Drills

Drills holes faster— Will not snap off shank or chip points— Outlasts four or five ordinary augers.
THE SALEM TOOL COMPANY SALEM, OHIO, U.S.A.



This Allis-Chalmers HD-21 is general handy man at the Furr Coal Company's mine. It builds and maintains incline ramps between cut and fill areas to provide short haul cycles. With rear-mounted ripper, it loosens overburden when necessary to insure continued, fast loading. It also acts as a stand-by pusher.

Two Allis-Chalmers HD-21 tractors and pull-type scrapers strip overburden, carry it down an incline and spread it in a worked-out section of the mine and return empty up another ramp. By this method, the Furr Coal Company reclaims land without rehandling material. Savings amount to 8¢ a ton or roughly $1.50 for every scraper load.

Furr Coal Company Strips Overburden, Reclaims Land in One Operation

saves 8¢ on every ton of material moved

The mobility of Allis-Chalmers tractors and pull-type scrapers enables the Furr Coal Company, Nelsonville, Ohio, to handle stripping and land reclamation in one operation. As scrapers remove overburden from new deposits, they haul and spread it in a worked-out section of the mine. This eliminates a second handling and saves an estimated cost of 8¢ a ton for land reclamation.

On this operation, overburden consists of earth and clay with very little rock. The big HD-21's have the power to load the 18-yd scrapers—usually without a pusher—and the speed to complete the cycle quickly.

"I've owned other makes of tractors and scrapers," says Mr. Furr, "and I have these because I believe them to be the best." Mr. Furr likes the Allis-Chalmers diesel engine, the construction of the tractor and the fact that it has proven torque converter drive. He also estimates that its thousand-hour lubricating intervals save about 30 minutes' servicing time every shift . . . "and this really adds up to important savings."

Find out how Allis-Chalmers equipment can bring new efficiency to your stripping and reclamation work. See your Allis-Chalmers Construction Machinery dealer.

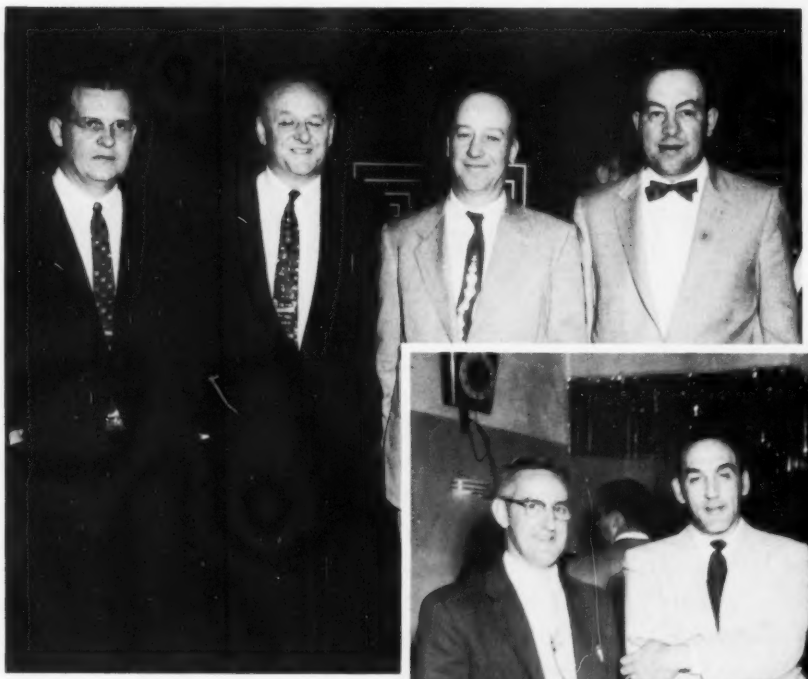
ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION, MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS

ANNUAL MEETING
Of The Independent Coal Producers Association

The annual meeting of the Independent Coal Producers Association, a group of coal strippers in northwestern Pennsylvania, was held at the new Elks home in Butler, Pa., the evening of May 8. Attendance at the meeting was the largest ever for that association. The principal after dinner speaker was Dr. S. A. Bradley of the Mellon Institute of Pittsburgh, who discussed the problems of stream pollution, emphasizing the necessity of co-operation by the coal stripper. Discussing the various methods of preventing mine acid water, Dr. Bradley stressed the importance of back-checking abandoned areas to be sure that acid preventive measures have not been changed either by nature or by someone who reopened the coal seam. Mr. Robert J. Trace, Assistant Attorney General for Pennsylvania answered some legal questions concerning stripping permits and their abuses.

President of the Association, William Harger, who is also President of the Sunbeam Coal Co.



Left: R. F. Hall, Beckwith Machinery Co.; J. J. Jenssen, Highway Equipment Co.; Russ Cravener, operator and Harl Bowser, operator.

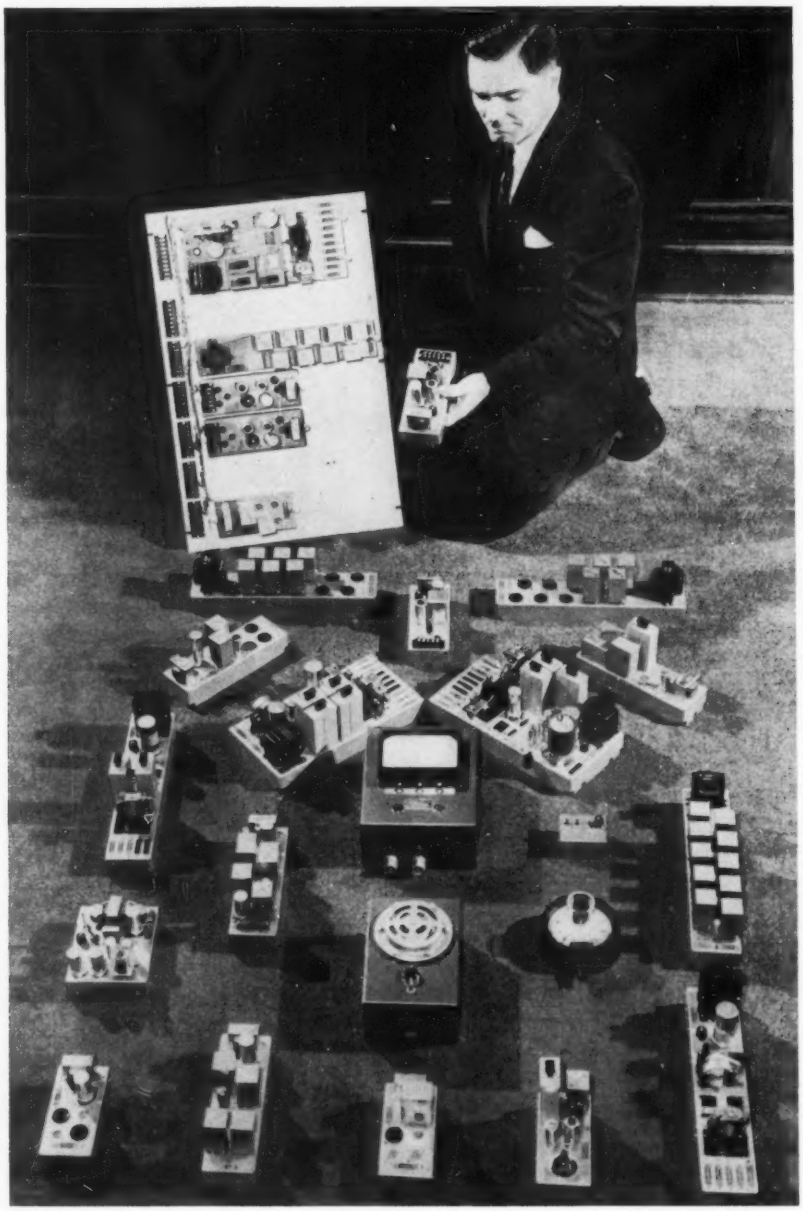
Left: C. T. Style, vice-president, Maximon Machinery Co.; John Chutes, operator; Jim Pugh, Anderson Equipment Co., and R. W. Kerry, operator.

At speakers' table, left: Dr. S. A. Bradley, Mellon Institute; Robert J. Trace, Deputy Attorney General, Commonwealth of Pennsylvania; George Bailey, the Memory, Music and Magic Man, J. O. Anderson, Tri-County Coal Co.

Left: E. M. Boyles, operator; H. Elmer Whitmyre, machinery dealer; Paul Boyles, operator; Elton R. Peterson, CIT Corp.; Ted Helsing, Highway Equipment Co.

At speakers' table, left: William Altvater, President and F. H. Mohney, Executive Secretary, Mineral Producers Association, Kittanning, Pa.; Lewis Evans, Deputy Secretary Mines, Commonwealth of Pennsylvania, J. P. McFarlane, Secretary Independent Coal Producers Association.

NEW ELECTRONIC BRAIN CONTROL SYSTEMS DEVELOPED



NEW ELECTRONIC BRAIN CONTROLS. A new method by which industry can select from a series of 21 standard "building block" components the best electronic control system to regulate push-button manufacturing operations from remote points is illustrated here by John J. Smith, president of The Sparks-Withington Company, developers of the unique process. Grouped in the foreground and held in Smith's hand are the 21 modular units. How certain strategic components are connected to enable companies to secure their control systems at costs of one-half to two-thirds less than the traditional custom-fabricated units is shown on the control panel, upper left. The new Sparton systems provide a "brain" and a "nervous system" to control vital production operations. Four years in development, the systems are now in use in the oil industry, in petro-chemical plants, and municipal water pumping stations. They are applicable to steel mills, mines, and varied process industries.

A new method by which industry can select from a series of 21 standard "building block" components the best electronic control system to regulate push-button operations from remote points, has been announced by The Sparks-Withington Company, of Jackson, Mich.

Developed after four years of research, this novel method is already in use in the oil industry, in petrochemical plants, and in municipal water pumping systems providing a "brain" and a "nervous system" to control vital production operations. A number of special features make the new method unique in American industry and susceptible to broad industrial applications. The modular units are inexpensively mass-produced, are hooked up merely by plug-in units which can be expanded or regrouped by semi-specialist personnel, and utilize a single standard communications channel which can handle hundreds of control and supervisory functions even at distances up to hundreds of miles, at major economies.

Most conventional control systems for in-plant or outdoor monitoring functions require a large number of communications channels to accommodate varied or multiple functions. Also, most present systems require substantial amounts of companies' engineering staff time to install and maintain custom fabricated units.

John J. Smith, Sparks-Withington president, related that the innovation had far-reaching significance because it punches through the limits of existing control systems and provides a whole new set of highly flexible control tools which will make it possible to extend automation much more broadly in American industry.

A large percentage of industry's control applications can now be handled by the present units available in the assortment of 21 electronic building blocks. Merely by connecting the stra-

tegic components dictated by the specific applications, companies can secure control systems at costs from one-half to two-thirds less than the traditional concept of made-to-order systems.

Five standard control systems are now available utilizing the modular units: (1) automatic alarms; (2) remote metering; (3) discreet control; (4) proportional control; and (5) transmission systems. They are all complete, integrated systems with all needed components supplied, and installations can be made by any plant electrician. The systems will function over telegraph and carrier circuits and coaxial cable; and to span long distances or difficult terrain, radio and VHF, UHF, and micro-wave circuits can be used.

The Sparton systems are presently in use remotely controlling and supervising widely separated unattended high-power pumping stations in municipal water works. Smith said they are immediately applicable to long-distance highly accurate control over petroleum and natural gas field pump lines, power generating stations, power transmission lines, chemical processing plants, and sewage systems. He said they are applicable to steel mills, mining operations, process industries, and many other types of mass-production processes where control and supervision are required for complicated machinery.

Citing the ease with which the systems operate over long distances, he reported that the Shell Oil Company is using the standard components to comprise two applications near Chicago to open and close pipe line valves, one from a control board 25 miles away.

By proper selection of the right prefabricated modular units, industries can build their own systems which are versatile enough to measure and transmit operational information to distant control centers on quantities of pressure, vacuum, speed, current, rate of flow, temperature, position, load, and count. The Sparton building block components, in properly integrated systems, will even report on the level of supplies or raw materials in a bin, vat, tank, or similar storage container.

Control features of the varied systems, which can readily be assembled from the standard modular units, are sufficiently flexible to turn any type of manufacturing process on or off, regulate sequence in a factory operation, apply proportionate amounts of control, or supply step and selective controls to plant production lines.

Two main classes of systems may be provided using the Sparton modular units: completely automatic, and centrally controlled where a single operator can check the condition of a whole manufacturing process by glancing at an integrated control panel incorporating meters, indicator lights, or a variety of alarm signals.

They will control processes operated electrically, mechanically, pneumatically, or hydraulically; and they are sufficiently sensitive to regulate fractional horsepower motors as well as powerful enough to control 1,000 horsepower units or more.

The miniaturized building blocks used to make up the systems take up approximately one-half to two-thirds less space than has been required in the past for control networks.

All adjustments and calibrations are built into the building block units. Routine maintenance checks are required no more than three times a year and can be carried out by plant electricians merely using a test meter and logging readings which are compared to fixed performance standards.

Maintenance of the modular units is on a calendar basis with standard units simply unplugged and spares plugged in until the original unit is serviced and reinserted into the system. Recommended replacement time cycles are after 10,000 hours of service, or 415 days of use.

Donovan explained that the new Sparton systems use, among other techniques, the traditional Morse principles of telegraphy to accommodate multiple signals on a single pair of wires, usually a telephone line leased from the local telephone company and reserved for the exclusive control function.

At present the Sparton building block technique is engineered to provide up to 125 channels of control available in the resulting systems, in a progression of 10, 25, 50, 100, and 125 channel systems.

In a normal 10 channel system, over each channel, it is possible to effect control of eight different functions, Donovan related. In a typical system for the petrochemical industry or a municipal water pumping station, these eight functions might operate as follows. A key is depressed at the control board and—

1. Pump turns on.
2. Signal flashes back, light turns on on control board signalling pump functioning.
3. If pump mal-functions, alarm light turns on.
4. Bearing temperatures are reported on. Four lights report on two motor bearings and two pump bearings.
5. Signal reports that pump is building up pressure.
6. Signal will report on the correct value of the pump pressure reading, or an alarm warning will sound for incorrect pressure.
7. Control order is transmitted which opens valve to any predetermined degree.
8. Can increase or decrease the open valve position in very small increments — all from miles away.

The systems can integrate memory circuits, and are flexible enough that electronic computers or punched card or punched tape activated equipment can be added.

Smith said that the latest major installation of the Sparton systems is now under way for the Southeastern Oakland County (Michigan) Water Authority which will control four pumping stations spread over a 100 square mile area. The Detroit area installation is expected to pay for itself in 18 months through effected economies of operation.

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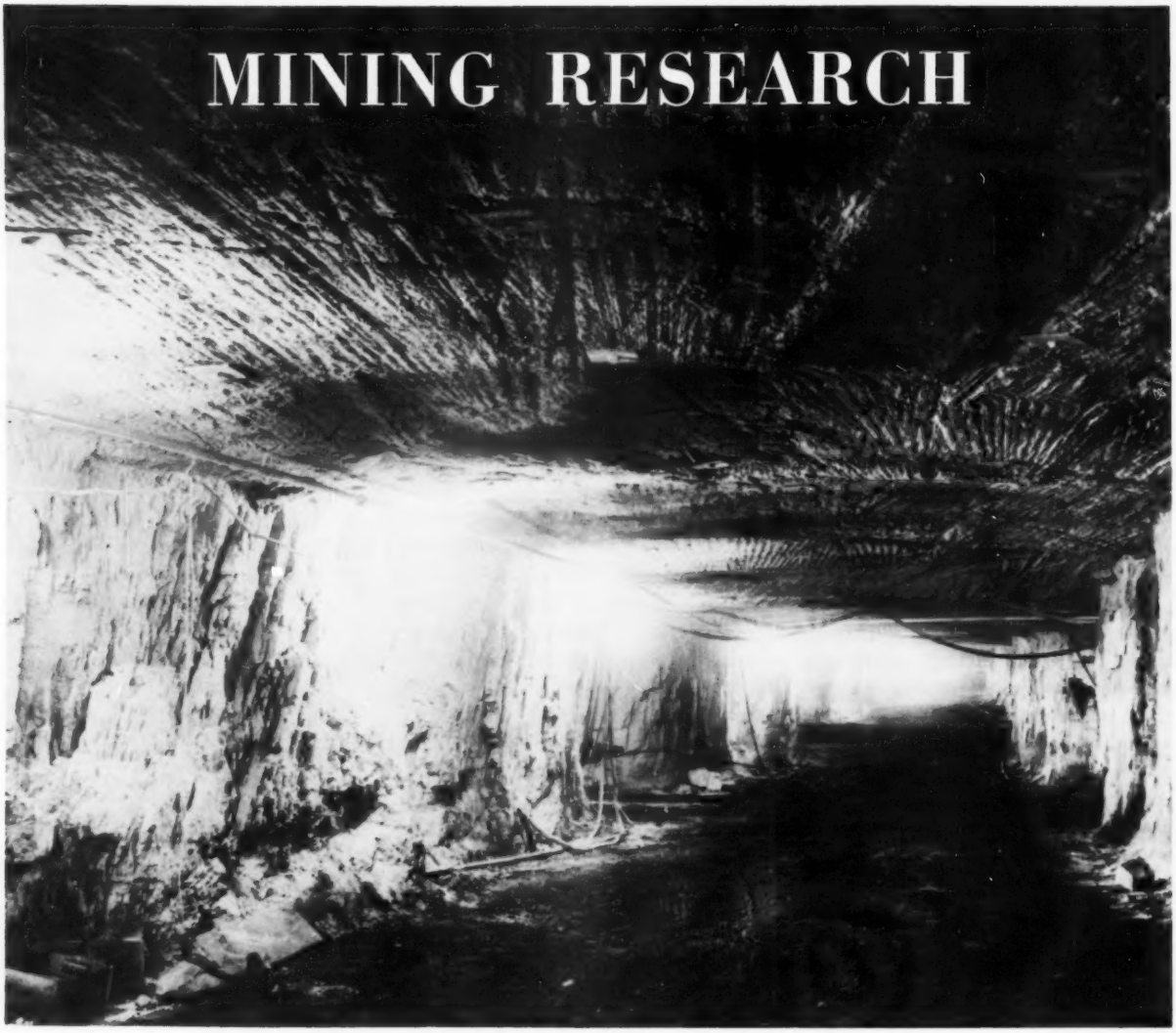
MINING RESEARCH



Experimental mine lighting by the Mine Safety Appliances Company on a shuttle car haulroad in mechanical mine.

MINING RESEARCH*

By Gerald von Stroh
Director of Development
Mining Development Program
Bituminous Coal Research, Inc.

The Mining Development Program is in business to reduce the cost of producing coal by developing new methods and new machinery for mining coal. Its basic method of attack has been to increase tons per man shift. Simple arithmetic will indicate the wisdom of this choice. According to the U. S. Bureau of Mines, the average price of coal at the mine is about $4.83 per ton. In underground mining, we produce about 8 tons per man shift overall. Our rate of pay is approximately $21.60 per day. We therefore pay about $2.70 per ton or one-half of the selling price of the product for labor.

There are a number of reasons why present coal production processes' require such a large amount of labor. It does not, however, hold that the process of mining coal demands a large amount of labor.

Henry Ford described the evolution of mass production by stating that first efforts to increase factory output was to increase the units of production, more workers, more hours, and more machines. "But," said Mr. Ford, "mere massing of men and tools was not enough. For instance, how could a man load 47-½ tons of pig iron per day instead of 12-½ tons? What really was needed, of course, was a method whereby the man did not load the pig iron at all.

"Mass production is the planned, orderly, and continuous progression of the commodity to completion. Keep the product moving and not the man."

This planned, orderly, and continuous progression is the answer, I be-

lieve, in coal mining as it was in manufacturing and can be achieved by the scientific viewpoint through research in the basic problems of the coal mining processes considered as a whole from the scientific angle.

We of the coal industry are prone to discuss mining in terms of daily problems, rather than standing back and taking a look at the forest. It might be well then to consider, What is Coal Mining.

Coal Mining is of course, a production process with its own inherent problems which can be divided into four major categories.

First is removal of the coal from the seam. Second, transportation of the coal from the seam to the surface, third, construction and maintenance of underground plant and facilities and fourth, the preparation of coal to meet the needs of the consumer. It is not, however, the intention of this paper to discuss preparation of coal.

The problem of coal mining is unique in that our source of raw material is constantly moving away from our shipping point. This can best be described as a manufacturing plant which has its raw material spread out over a large amount of ground and instead of taking the raw material to the machinery, we take the machinery to the raw materials and leave our loading dock untouched.

This means that we must not only constantly extend our transportation facilities, but we must also constantly build or extend our factory. We must build our roof support and extend our ventilation system, power lines, water lines and other utilities. We also must bring from the loading dock, the materials necessary to the manufacturing processes such as spare parts for machinery, rock dust, cutter bits, etc.

In the very early days of coal mining, the problem was relatively simple. The only machine used was a man and as late as 1860, man power was cheaper than explosives. At that time, to go into business all you needed was a pick, some wedges, a shovel and some sort of cart, into which to load the coal. The cart was hauled with man power, although occasionally horse and mule power was used.

As man power became more expensive and engineered materials became cheaper, the exchange of man power for mechanical power slowly started. One of the first places where man power was replaced was by using explosives for shooting down the coal. Undercutting was one of the most arduous and time consuming jobs, so the first mechanical device generally used was an undercutting machine.

From this early start, the mechanization of coal mining has progressed to the point of where at least in some mines, virtually every function of mining is performed by machines. However, this mechanical equipment is still performing individually, the same basic functions as was performed by the original hand miner, undercutting, drilling, shooting, loading and transporting the coal. Also maintaining the roof and auxiliary services.

This mechanical equipment has been successful to the extent that the price of coal has remained fairly stable despite substantial increases in the cost of labor, equipment and supplies.

In 1947, many leaders of the industry felt that there was a very definite limitation to the efficiency which could be obtained with this type of equipment. However, instead of continuing to evolve along the lines of the methods developed by the original hand miner, they felt that an entirely

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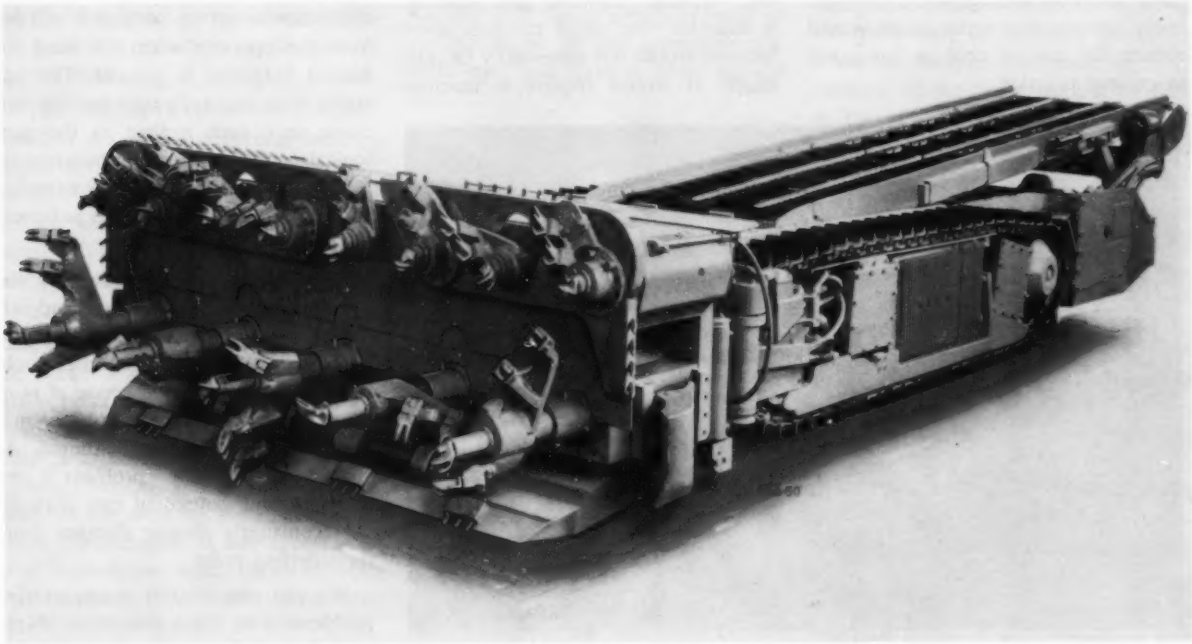


A low type Jeffrey Comole, one of the first full face mining machines.

MINING RESEARCH

new approach to coal mining should be taken. The industry organized a Mining Development Program and provided adequate funds for initial experimental and engineering studies of the problem. The concept evolved from this studying was not particularly new. Men had done substantial dreaming of this kind of mining since about 1870 and some progress had been made toward this end.

However, the Mining Development Committee introduced a new thought, that of a complete mining system to be ultimately operated on a full and completely automatic basis. Neither the industry nor the Committee felt that this would be either simple or easy and they were certain it would have to be taken in steps. Whatever steps taken should lead toward the ultimate goal of a complete system of mining.

The Committee and the Industry were realistic enough to recognize that interim or partial solutions would need to be put into practice as the program proceeded. No one could predict the time required for a complete solution and there would undoubtedly be many good ideas which could be put into fairly immediate practice which would reduce the cost of coal as compared to current practice.

The results of this work have been substantial. In the year of 1955, there was almost one million tons of coal mined with labor savings in the order of $1.00 per ton on a product selling for about $4.50 per ton at the mine. It is doubtful if any major industry has ever in a period of six to seven years worked out an improvement in its basic processes which would amount to an overall reduction in the order of 20%. Certainly, the long range goals of the Committee will be pursued and cost reductions much greater than 20% achieved. The time consuming task of putting these solutions into form for general and reliable use is still ahead.

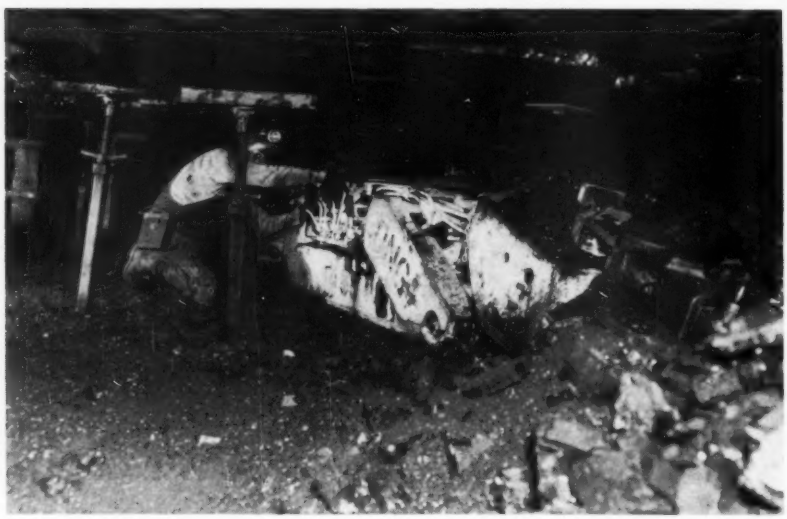
How have these results been achieved and greater results to be achieved in the future? The Committee itself was made up of practical operating people, each member representing a specific geographical and commercial interest. This assured that the overall needs of the industry would be represented, both this coal as well as high.

The Committee analyzed the problem and recognized that the first need was for a single machine which would combine all of the functions of cutting, drilling, shooting and loading. A machine that could combine these features would not necessarily be adequate. It would require a machine which would eliminate, in so far as possible, skill on the part of the operator, produce an acceptable size consist, eliminate the need of the operator to give the machine constant and minute attention. This had been called a full face continuous mining machine. During the period the machine was being evolved and as a result of the stimulus created by the Program, a number of machines which combined the various functions of the hand miner were tried and used by the industry. These machines, for the most part, require immediate and constant attention on the part of the operator. Approximately 400 of these machines are currently in service.

The full face machine lends itself readily to automation. This is indicated by the fact that as soon as a sensing device has been developed, existing machines can be fully automated with few changes and in a short period of time. The fully automated machine, based upon the sensing device now under consideration by the Committee will orient itself within the seam, in other words, follow the seam up and down hills and along a predetermined path. The need for human judgment will not be completely eliminated, however the machine can be set up so that it will inform the operator when the need for human judgment is present. The operator then manually operates the machine until such a time as the geological conditions permit operation on a fully automated basis. It is expected that periods requiring human judgment will be quite infrequent.

Once the basic principles for the machine had been established and sufficient engineering studies completed to indicate that these principles could be achieved, the second phase of mining, transporting the coal from the machine to the surface was studied. As mentioned earlier, the problem is one of having the source of raw material at a constantly greater distance from the shipping point.

We can classify our transportation problems into three categories. First, permanent—A system that can be in-



FRONT VIEW OF A LONG MODEL 88 PIGGYBACK LOADING MACHINE.

stalled and operated without relocation for a period of a year or more. Second—Semi Permanent Transportation systems which are installed and operated for one or several months before being moved. Third—Temporary or face transportation systems which require constant extension or retraction.

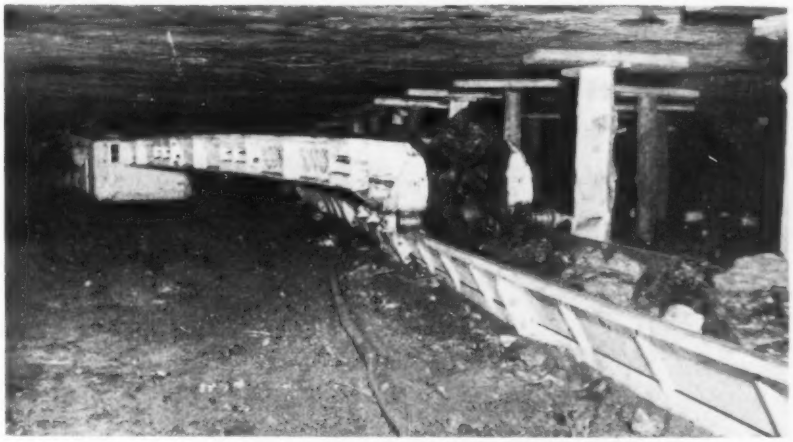
Obviously, Face transportation is the most complex. The ideal solution is one which would permit conveying the coal as rapidly as it is being mined, without interruption for distance of zero to 300 to 600 feet and without the use of man power.

This being the most complex transportation problem, it was given first attention by the Committee. A number of solutions to the problem have been evolved. The only currently available system essentially permitting conveying from zero to 300 feet without interruption is somewhat complex, has a high capital cost and requires man power. Another system which will convey from zero to 300 to 600 requires frequent stops for extension, is quite expensive, and requires a minimum of two men.

These interim solutions are in daily service and compared to conventional equipment, under certain circumstances, permit a reduction in the cost of mining coal.

The Mining Development Committee has on an experimental basis a conveyor which will convey from zero to 600 feet without interruption and in its final form should permit the operation of this conveyor without the use of man power.

As these systems were evolved, it was determined that production would be more highly concentrated. At a given point or area, several times the amount of coal would pass per shift than is experienced with conventional mining. Further, the handling of supplies to the working places would be more concentrated. It was appreciated that bottlenecks would exist in both the permanent and semi-permanent transportation systems as now in use. This again has been given study and an entirely fresh approach. Neither belts nor mine cars appears to meet the requirement of this more highly concentrated production.



REAR VIEW OF THE LONG PIGGYBACK CONVEYOR

The new concept of transportation utilizes the basic idea of a trolley conveyor or monorail. The trolley conveyor, a by-product of the automobile industry, has heretofore been considered as being limited to unit and package conveying only.

The Mining Development Committee studied the trolley conveyor and felt that it could be adapted to the continuous transportation of coal. If successful, it should eliminate many of the limitations of belt conveyors and mine cars and have a lower capital cost.

The trolley conveyor can also be used for surface transportation making accessible many coal fields currently too far from commercial transportation to be economically mined.

It would therefore appear that the basic problems of production is well in hand, to the point of where we can expect substantial reductions in the cost of producing coal by means of concentrated production having relatively complete continuity of production.

This would hold true if it were not for the fact that we must continually build our factory and extend our factory's utilities. The roof in coal mines must be supported. It became evident that current methods of roof support would cause an interruption of production. It therefore became necessary to evolve a method of roof support which would permit good safe roof support without interruption or interfering with production. The Committee is evolving a system of roof support made of prefabricated beam sets which can be carried on the mining machine, set in place by the operator without stopping or interfering with the production of the machine.

Current practice requires installing rock dust within 50 feet of the active places. Conventional rock dusting equipment would not permit applying this rock dust in adequate quantities while the machine was operating, first, because of the large amount of dust in the air and secondly, the amount of rock dust in bags that would need to be transported to the face.

Experimental work instigated by the Committee has been conducted and appears to offer promise of being successful which permits applying the rock dust by pumping it from a non-conjested area to the face and applying it wet. rather than dry, thereby eliminating both problems. Similarly, the problem of maintaining power, fresh air, water, etc., are being studied. Since they are somewhat simpler, there does not seem to be much question as to their favorable solution.

With substantial concentration of activities in relatively limited areas in the coal mines, it was recognized that

(Continued on Page 32)

Big output is built in

Individual Design

We believe that the right way to build an excavator is to match every part—from boom point to treads—to the specific rated capacity of the machine. At Bucyrus-Erie and Beckwith Machinery Company we call this Individual Design.

Here's what it means

Individual Design means striking the right balance between power, weight and speed for sustained high output at low cost over a long period of time. Bucyrus-Erie excavators match engine to dipper size so there's no waste of power; deck machinery components are not overloaded or underworked; boom strength and weight are right for the dipper size. There's never any overdippering or underpowering.

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Your stripping and loading operations can use this kind of money-making performance so get the full details from your nearest Beckwith location. We've got all the facts on Bucyrus-Erie excavators from the 10B to the 88-B.

BUCYRUS ERIE

This older model Bucyrus-Erie 22-B with Caterpillar D318 Engine was purchased by the Frantz Construction Company of Uniontown, Pa. in 1951. It has been used in both stripping and construction work and is shown here working on coal operation in Somerset County.

your Bucyrus-Erie from BECKWITH

Consider the 22-B for Example

FAST DIGGING

Exceptional synchronization of speeds and power results in well-balanced crowd and hoist, and concentrates maximum digging force at the dipper teeth.

SPEEDY SWING CYCLE

Smooth, quick acceleration and deceleration, accurate stops.

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Operator can "step on it" because he always has the feel of the machine . . . handling ease . . . full visibility.

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Big track-type mounting provides large bearing area that means exceptionally stable, solid working foundation.

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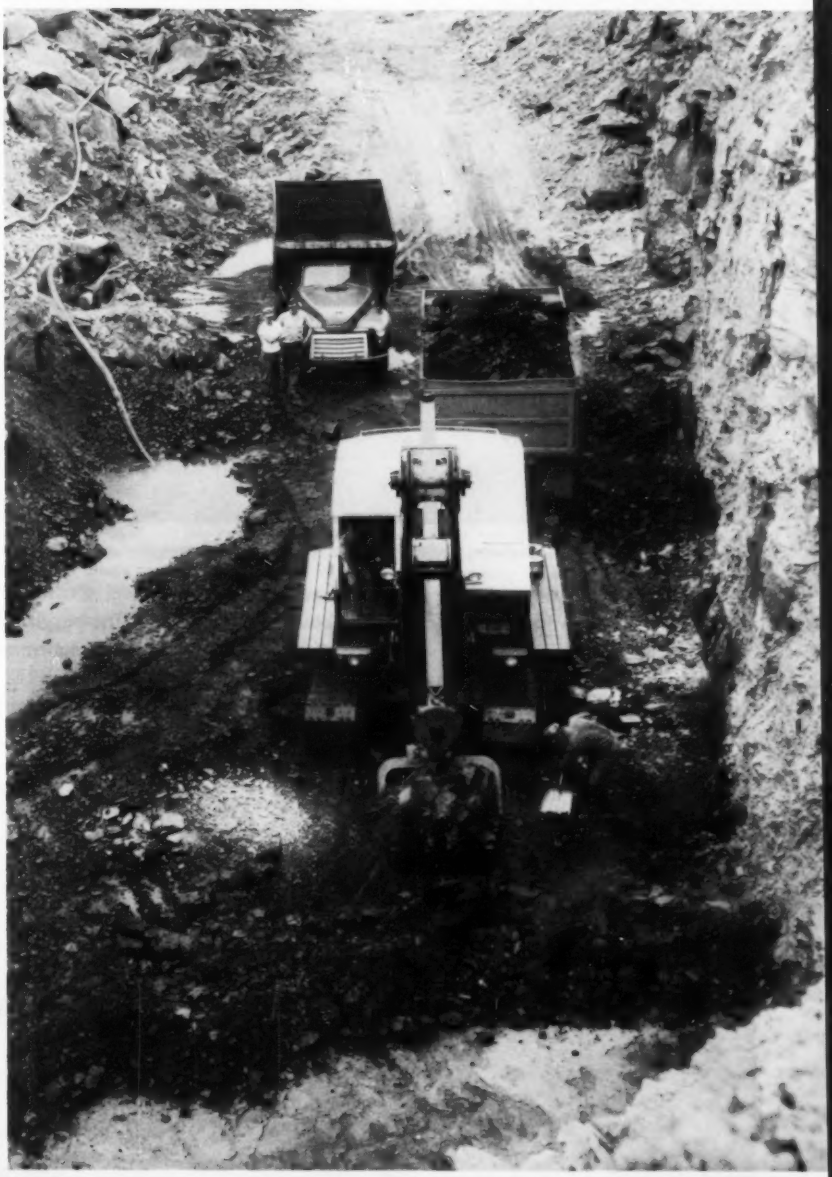
Power transmitted direct to point of action . . . fewer parts . . . less friction . . . less inertia . . . less lost motion . . . minimum power loss.



This 22-B working in the pit was purchased in 1955 by the Zacherl Coal Company of Oil City, Pa., and is powered by a dependable Caterpillar D318 Diesel Engine.

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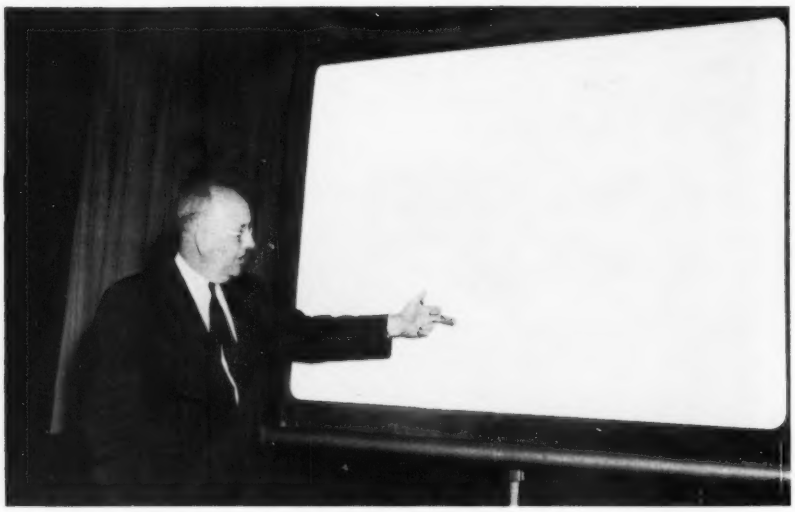
PITTSBURGH COAL MINING INSTITUTE MEETS



Professor Holland giving his talk on roof control.

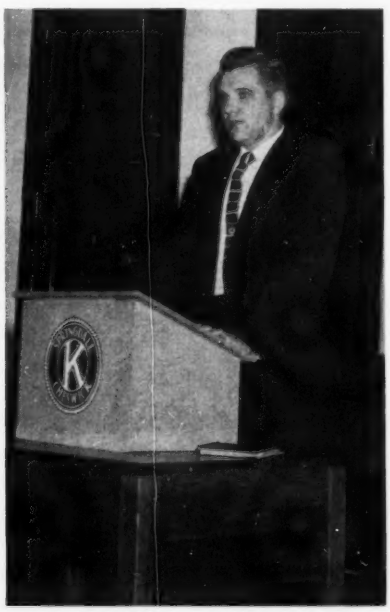
The Spring Meeting of the Pittsburgh Coal Mining Institute was held at the Cheswick School, Cheswick, Pennsylvania, the evening of May 4th. This meeting was under the direction of W. E. Hess, manager of mines, Jones & Laughlin Steel Corp. S. M. Cassidy, Vice-Pres., Pittsburgh Consolidation Coal Co., was chairman of the program committee.

While the attendance was considered good, it was practically all local and did not measure up to the attendance of the annual banquet of this institute, which is probably the biggest gathering each year of coal men anywhere. It appears like this institute needs better backing by the higher executives in the industry to bring it up to what its potential is in the way of advancing the industry. More men like W. E. Hess and S. M. Cassidy are needed to put life into the institute.

The principal speaker was Charles Holland, professor, Virginia Polytechnical Institute, and considered the best authority on what makes mine roofs fail. Mr. Holland used slides and tabular matter to illustrate his talk. His talk was very informative but he admitted that much more needs to be learned about mine roofs. Anthony Shacikowski, Gen. Supt. Leechburg Mining Co., who tried more types of spalling preventing than any man known, told of his plan to wallpaper rib and roof, using asbestos paper.

S. M. Cassidy, was chairman of the program committee.

W. E. Hess, president of the Institute.



James M. Krese, Supervisor, Mechanical Mining, Republic Steel Corporation, Uniontown, Pa., telling of the methods of roof bolting at his mines.

Leaders of union and management at the Lochgelly Mine of the New River Company at Lochgelly, Fayette County, West Virginia, have enrolled all the workmen and officials (total of 367) in the U. S. Bureau of Mines Accident Prevention course now being conducted at the mine. Participating in the planning conference seated left to right were: Ralph Allenbaugh, Mine Superintendent; Francis Foster, President Local Union 6046; Lloyd G. Fitzgerald, Mining Engineer U. S. Bureau of Mines, Instructor; Frank Simms, District Inspector W. Va. Dept. of Mines. Standing —Left to right: William L. Burruss, Jr., Chief Engineer The New River Company; Andrew Easton, Jr., Inspector-at-large New River Division, W. Va. Dept of Mines; Bernie Kania and Richard Carter, Safety Committeemen and Jonathan Allen, Mine Committeeman, all of Local Union 6046; and James Coffey, General Mine Foreman.

SAFETY NEEDS PROMOTION

By J. E. Bedford

A review of the safety record of any mine will reveal that the accident rate goes down during a safety training program. It is held down immediately following this type of program. Then, suddenly accidents will start to happen all over the mine. The accident rate will then be as high or higher than it was before the safety program was put into effect.

Why?

Usually it is because the newness of the safety program has worn off around the mine. Workers and supervisors have fallen back into their old habits . . . they neglect to keep practicing the safety rules covered in the initial safety training program.

When the accident rate starts to climb, mine management is apt to consider the safety program a waste of time and money and cast it aside. This may pare a few dollars from the evident overhead expense, but the hidden cost of accidents will remain —lost time, lower production, repairs, and lower employee morale.

Progressive mine management does not stop the sales promotion and advertising program when business starts to decline. They put more effort into promotion. This may include more aggressive selling, sales contests, more extensive advertising, selecting a new theme or slogan for the advertising.

Whatever is done is promotion—not stopping!

Safety programs need a "shot in the arm" to keep them at top efficiency and to keep the accident rate at a low level. Here are some ideas you may find helpful in promoting safety in your mine:

1. Bulletin Boards

Safety posters can be purchased in quantity for use on bulletin boards. However, this type of poster usually falls into a standard pattern. A check with the employees the day after the poster has been changed will not reveal much identification or interest. Workers form a habit of tuning out the standard safety poster just as they have learned to tune out radio and TV commercials.

(Continued on next page)

Accidents such as crushed fingers, strained backs, cuts and bruises are common among coalminers. In this Treatment Centre at a pit-head in Britain, Sister Ida Hammond has treated scores of minor cases of this kind, and is always prepared to deal with more serious injuries.

2. Picture current accidents — not ancient history in the mine.
3. Have the poster tell the story—who, what, why, and how the accident could have been prevented .
4. Keep copy on safety posters at a minimum—people do not have or take time to read a long message.

2. Personal Letters

Every time the safety record of an employee is reviewed, it is suggested that the safe working employees receive some kind of a personal letter from a top executive in the mine. This can be a short note of congratulations to each employee who has gone through the period—six months or a year—without an accident.

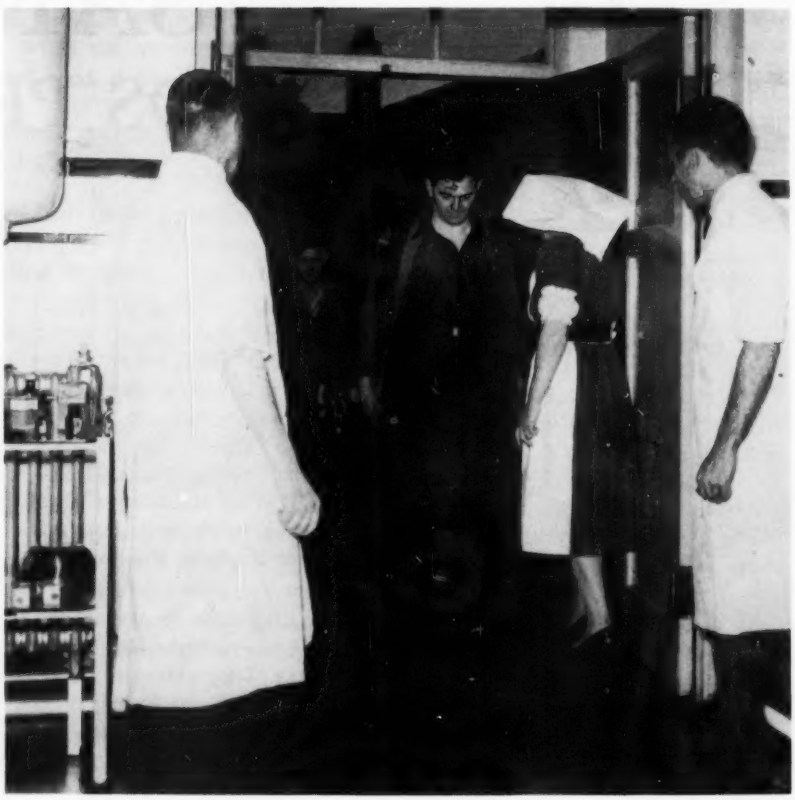
These letters can follow a form yet be made personal by a review of each individuals long-standing safety

Part of the reason for this lack of interest in the prepared safety posters is that they lack mine human interest. The people pictured on the poster are not known to the people in the mine. The scenes illustrated may be for an accident in a steel mill or a tire plant and lack industry identification necessary for arousing the interest of the workers in your mine.

However, when this poster idea is changed to a poster of an accident in your mine, a photograph of one of your men who has an enviable safety record, or a picture of some new type of safety equipment, the workers will read and remember the safety poster. This will have human interest for the men in your mine.

Here are some suggestions to make your personalized safety posters more effective:

1. Change the poster frequently — at least every two weeks.



Medical Centres, staffed by State Registered Nurses are provided at the larger collieries in Britain's coalfields. Here a stretcher case is shown being received at a Medical Centre.

record. If the employee received a safety letter a year ago, for instance, the second letter might start something like this:

"Last year when I wrote you about your fine safety record, I sincerely prayed that I would be able to send you another letter this year. You have gone two years without an accident! Congratulations, John."

Mines with a limited number of employees may find that this form of stimulation is best when the letter is delivered to the home of the safety-minded worker. It helps the family realize how important safety is considered by the management of the mine.

You may want a more frequent system of writing to new employees. Statistics prove that new workers are more apt to be accident-prone than older workers. Thus, new miners receive a letter when they start, after a month, three months, six months, nine months, and one year. After this time the new worker is placed on the regular roles of safe workers.

Under this plan, employees who have had a serious time lost accident receive letters of congratulations when they return to work, after a month, and again three months later. It is not because these workers need a reminder, but they will talk safety, be more observant of other worker's unsafe work, and be good on-the-job safety trainers for new employees.

Another plan for these letters is to send one to the men in one section of the mine and another to those in another section. This starts a form of rivalry between the miners to establish the best safety record.

Mine management using personal safety letters will find the following rules helpful:

1. Don't use a mimeographed form letter—make is personal or don't send it.
2. Tie-in with past safety letters to make the congratulations more personal and more sincere.
3. Work out a system so that none of the employees are overlooked in this safety letter program.

3. Contests and Drawings

Safety contests have been used in many mines with a variety of results. If the contest is successful in keeping the accident rate at zero for any period of time, the contest drags on for months. Employees tend to lose interest after a month and the value of the safety contest is lost.

However, if the accident rate is particularly high in a mine, the contest can be used for a short time to provide a stimulant to get things back to normal. Then, after the contest has run for thirty days the awards are made. This will eliminate the long drawn-out waiting and the lack of interest that may develop.

Another form of contest that mines have found successful is to have a weekly safety drawing. Management puts up a weekly safety award. The amount will depend on the number of employees and the seriousness of the accident rate. Each week the workers who have had sixty accident-free working days are entered in the drawing.

After a worker has had an accident, he must maintain a sixty-day safety record before he can participate in the weekly drawing. This keeps everyone safety conscious and ties in with the payroll pools that have developed recently.

A variation of this weekly drawing is to eliminate all miners on a shift where there is an accident on the shift. Thus, all miners on a shift suffer if one miner has an accident. Safety is a topic of conversation, observation, and activity all the time.

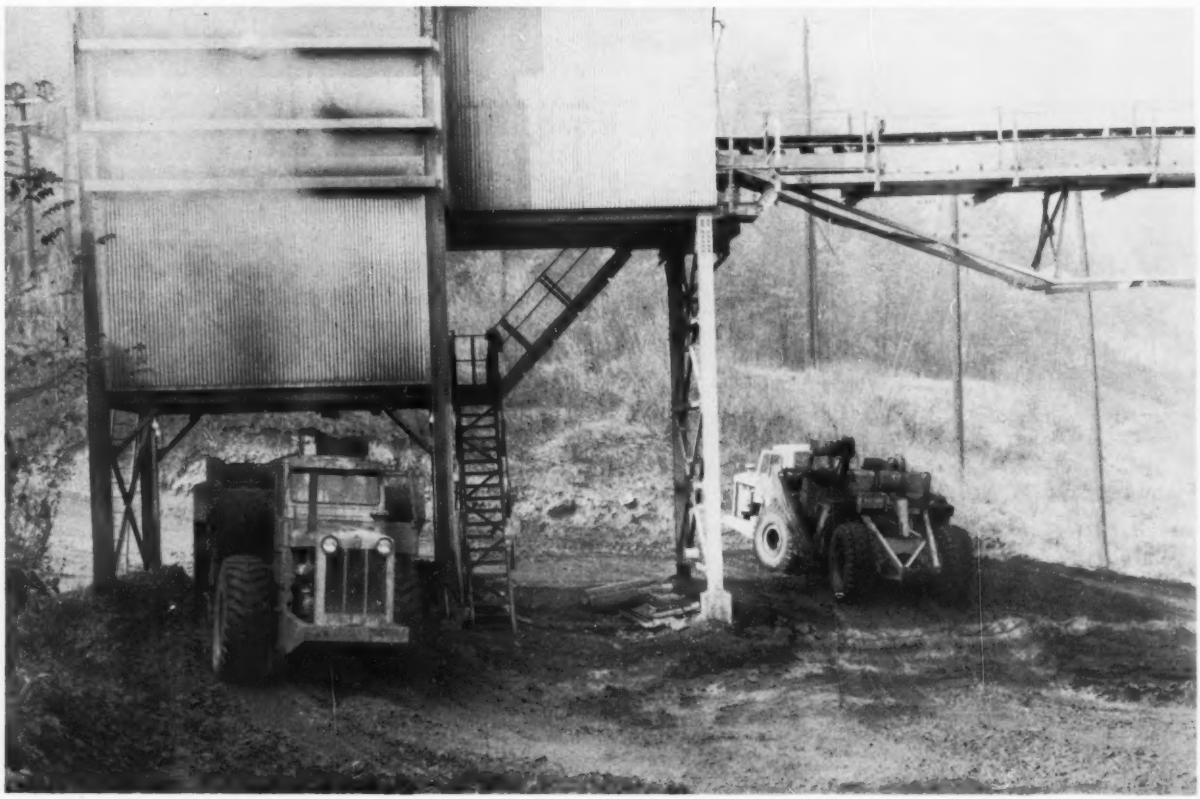
Best results are obtained when the contests and the drawings follow these suggestions:

1. Keep the time limit of the contest under thirty days and draw-

(Continued on Page 32)

Shaking hands on the port side isn't exactly proper for anyone—except a fellow like Charles O'Roark (left), general manager of the Clearbrook Coal Company, Cumberland, Ky. He has been doing a great deal of left-handed shaking lately to prove a point about first aid. Mr. O'Roark's entire right hand was burned severely by a cutting torch while he was assisting with repair work in the mine. Prompt first aid treatment, according to the victim's doctor, prevented the burns from developing into third degree and causing stiffness of his hand. A skin graft probably would have been required. Twelve hours elapsed between the time of the mishap and the time Mr. O'Roark could consult a doctor. Application of Foille aersol burn treatment, from the mine's M-S-A First Aid kit, immediately after the accident controlled shock and helped preserve damaged skin tissue. Today, Mr. O'Roark's hand bears no scars or other indication of the burn. That's why he uses the left-handed shake to call attention to importance of prompt first aid. With Mr. O'Roark here is Dewey Raleigh, owner Pine Ridge Coal Co., Cumberland, Kentucky.

EARTHMOVER SPEEDS MINE WASTE DISPOSAL



Timing is important in the DeBaldo Brothers' operation. Here one of his Tournapulls circles behind to come under the hopper as the other pulls out with its load of "boney." Operators of the scrapers handle loading themselves. When the machine is positioned, they dismount and handle hopper control. Loads range from 16 to 20 tons each.

(Earthmoving scrapers are not new to coal mining. For years they have been used in handling and stockpiling as well as for stripping overburden in open pit operations. But, here is a new application which further extends their usefulness around a mine.)

When you tackle the job of hauling mine waste to the dump at a rate of 1,500 to 2,000 tons per day, you need rugged big capacity equipment that moves fast. This is the problem that DeBaldo Brothers of Glenshaw, Pennsylvania, faced when they contracted to handle disposal of "boney" for a large mine just north of Pittsburgh, Pennsylvania. The solution—use earthmoving scrapers.

A sticky wet slag, void of B.T.U.'s, the "boney" at this mine is continually carried to a hopper by conveyor belt. DeBaldo's job—load from the hopper, carry the material nearly a mile, and waste it in a gulley.

First consideration in the choice of the scrapers according to Peter DeBaldo was their speed. They travel at a top speed of better than 25 mph. In addition, they offered other advantages which could well be applied to the job. The big low-pressure tires would provide flotation allowing them to operate on the soft waste dump without getting stuck. Simple, rugged construction eliminating springs, frame, steering assembly, drive shaft and frame would shorten lubrication time and simplify maintenance.

In actual practice, DeBaldo says the scraper design adapts itself perfectly to the job, too. It maneuvers extremely well, is low enough to fit easily under the hopper, and the big square open top permits the operators to load the material quickly.

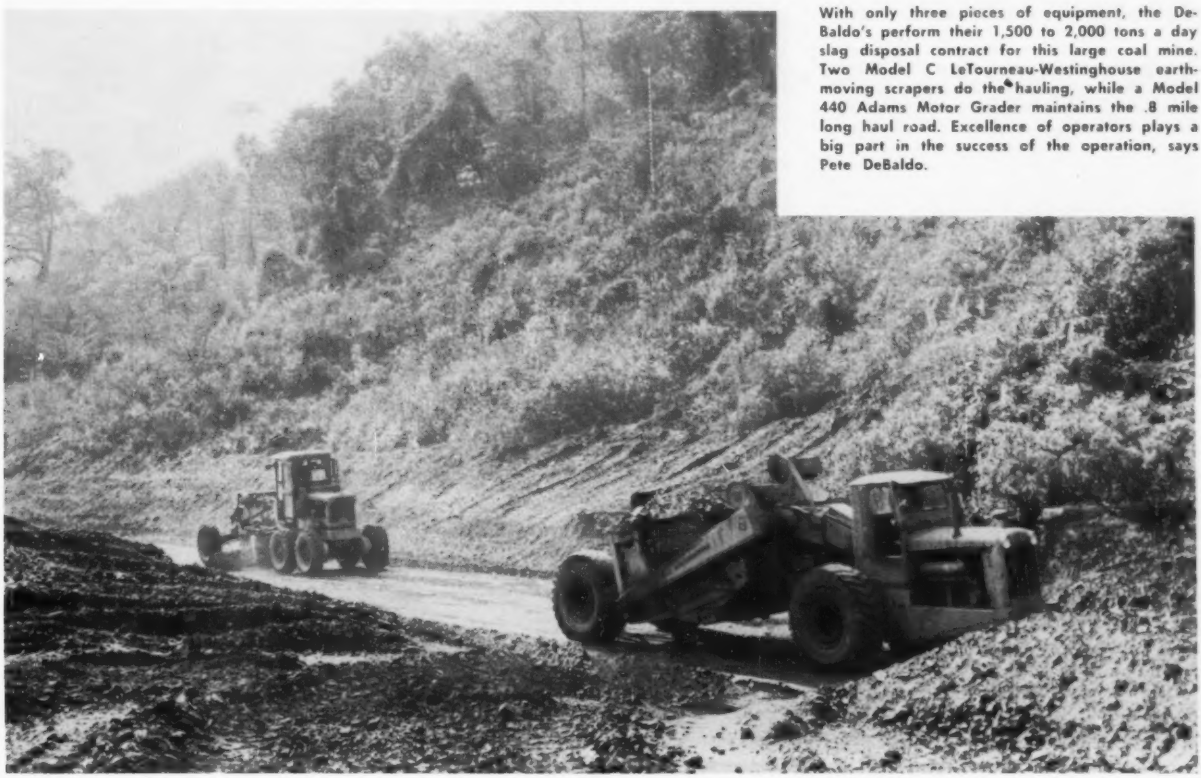
The scraper's ability to spread waste on the dump in controlled layers with the machine on the run has definite advantages. DeBaldo points out. Not only does it keep the operation moving but it lays waste out evenly so it dries more quickly to provide a firmer footing for subsequent trips. All in all, during the course of a day this adds

At the dump, the Tournapull's, on the run, spread loads in even layers. This keeps the area flat, eliminating need for a dozer tractor and at the same time allows material to dry more quickly so footing will be good for subsequent hauling trips. The machines have full electric controls including electric power steering.

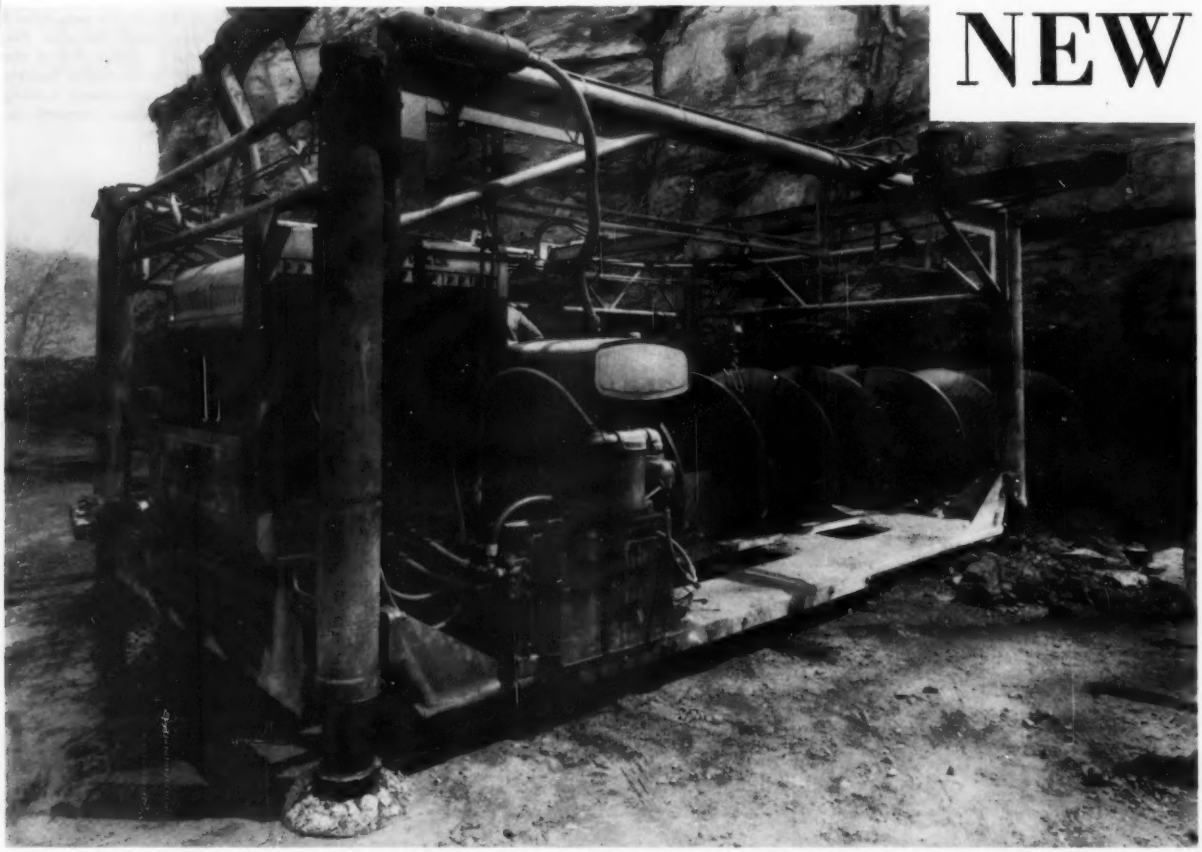
up to more trips from hopper to dump. At the same time, laying the loads smooth keeps the area level so it is not necessary to use a tractor dozer on the pile.

With more than a year's experience behind them, the DeBaldo Brothers maintain their scraper method in this operation has proven best and most economical by far. Emphasizing the point, Peter DeBaldo insists, "Compared to trucks for the same job, the scrapers will haul twice the slag, twice the distance at half the cost!"

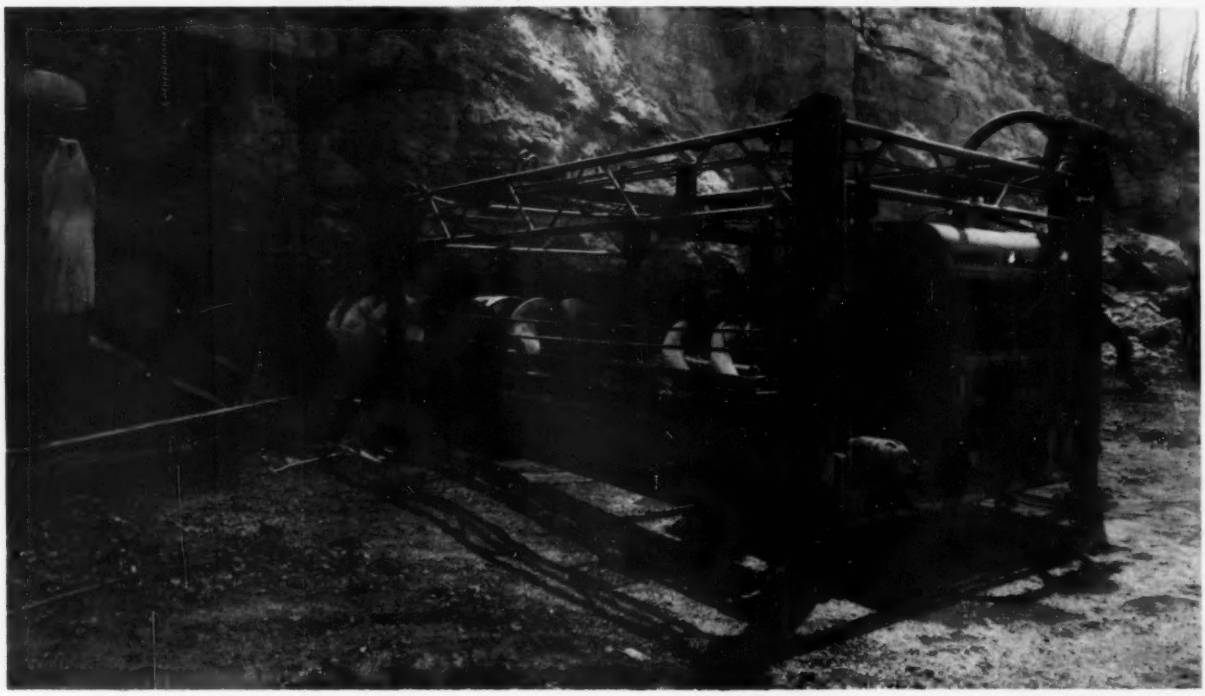
—END



With only three pieces of equipment, the DeBaldo's perform their 1,500 to 2,000 tons a day slag disposal contract for this large coal mine. Two Model C LeTourneau-Westinghouse earth-moving scrapers do the hauling, while a Model 440 Adams Motor Grader maintains the .8 mile long haul road. Excellence of operators plays a big part in the success of the operation, says Pete DeBaldo.



Side view showing how the retaining pan holds augers as they are recovered from previous cut.

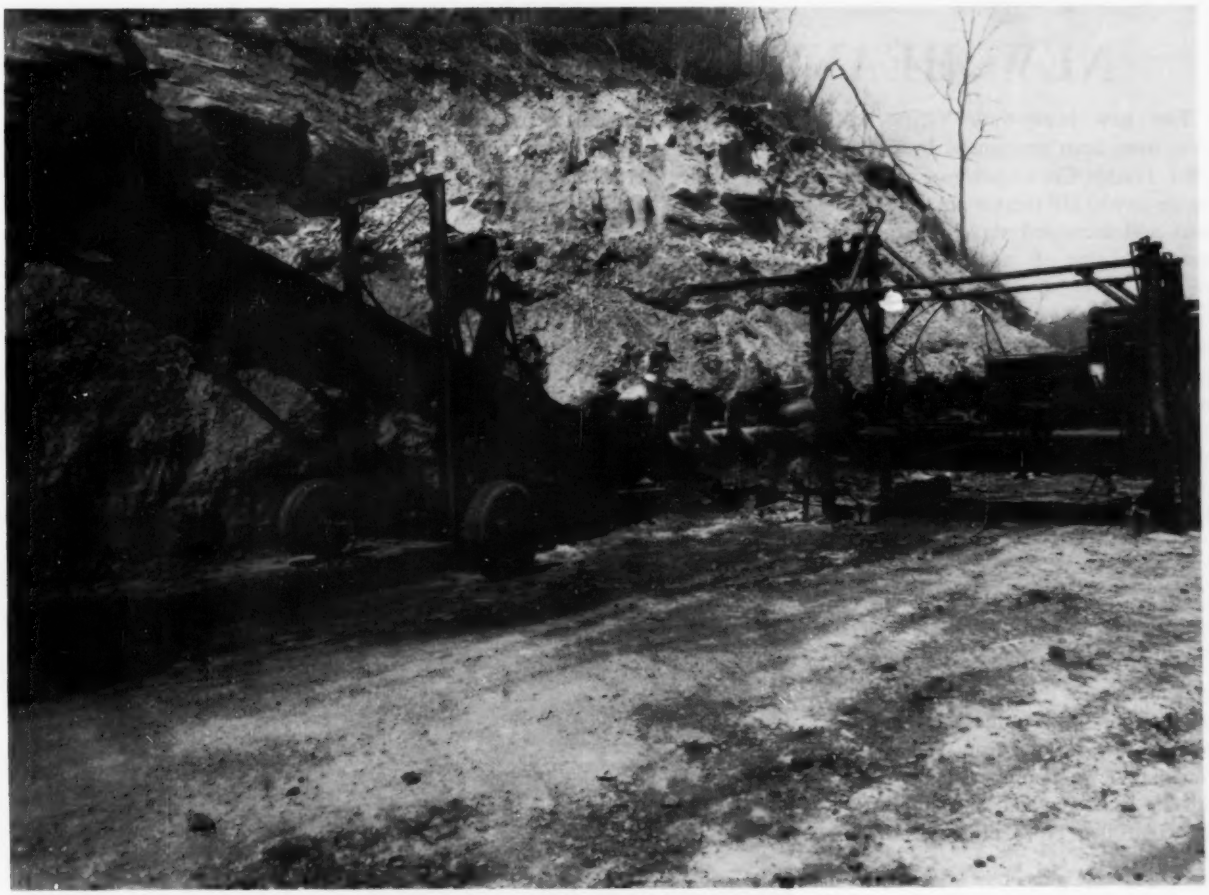


Another of the late type Hardsocg Augers recovering coal on mountain side which could not be mined by the deep method.

AUGER MINER

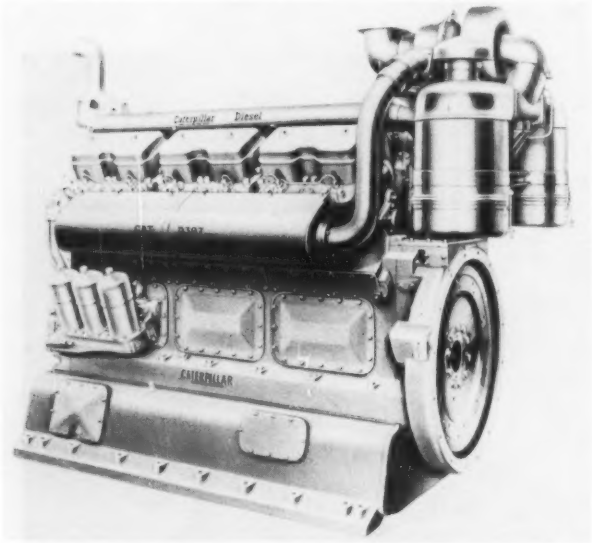
In keeping with the demand of the coal industry to increase production per man and reduce cost per ton in order to compete with gas and oil fuels which have very low man hour cost per million BTU's, the new Cardox Model 235 Auger Miner was engineered and built for large tonnage at low cost. With a 56 auger, this unit is capable of producing up to 700 tons per day. It is so compact that it can be worked in 26-foot wide cuts. It is self-positioning with a six-foot range and can drill one hole over the other if desired, in high seams. An added feature is a troughed pan for retaining augers as they are recovered from the previously drilled hole.

A Caterpillar D-8 tractor makes and maintains haulage roads.

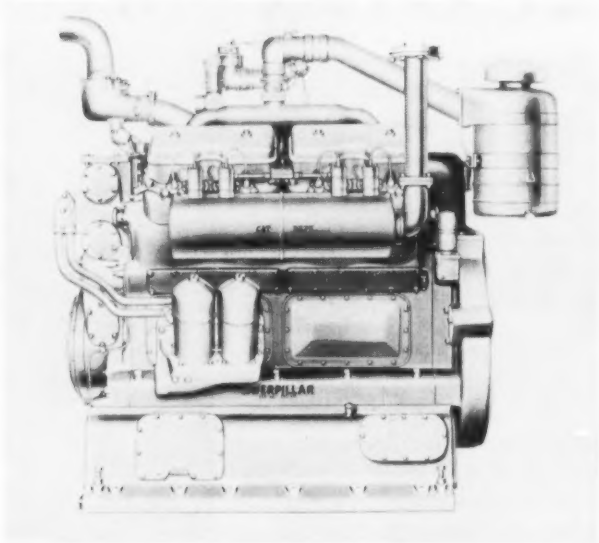


View showing the new Cardox Auger Miner in working position.

YOUR NEW EQUIPMENT DEPARTMENT



A left rear view of the new 650 HP Turbocharged Cat D397 Diesel Engine is shown here. New cylinder heads and exhaust manifolds are featured on this engine. It is also available in roots-blown, naturally-aspirated and spark-ignited versions.



This is a left side view of the new 400 HP Cat D375 Spark Ignited Engine. This new engine features a 10 to 1 compression ratio, a low-tension magneto ignition system and new "deep-domed" pistons. It is designed to operate on low-cost natural gas.

NEW HEAVY DUTY V-TYPE ENGINES

Two new heavy-duty V-type engines have been announced by Caterpillar Tractor Co. Capable of producing up to 650 HP (maximum), the new units add increased versatility to the company's line of modern industrial engines.

Available in turbocharged, roots-blown, naturally aspirated and spark ignited versions, the new eight and twelve cylinder D375 (Series D) and D397 (Series D) Engines are of four-cycle design, as were their predecessors, the D364, D375, D386 and D397.

Principal differences between the new engines and the former models are in the cylinder heads, exhaust manifolds, method of supercharging, and in the case of the spark-ignited engines, the fuel used and the method of igniting it. Inherent advantages of the former models, such as the completely water-jacketed, port-free cylinder liners and the low injection pressure, precombustion chamber type fuel injection system have been retained.

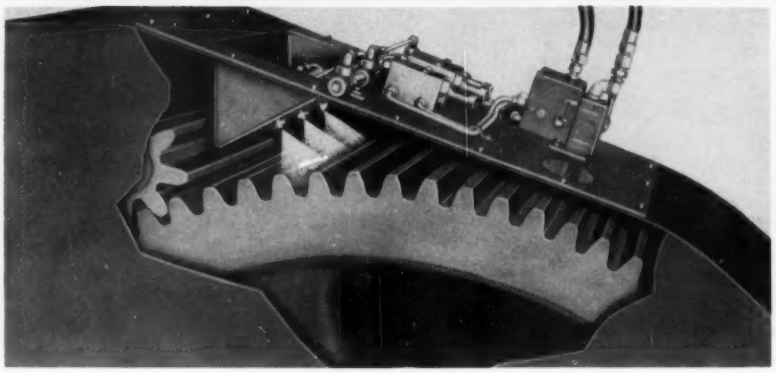
The new turbochargers now available for these engines enable them to produce increased power with less fuel by using the energy of exhaust gases which would otherwise be wasted. Improved engine breathing ability, the result of a new cylinder head design, makes it possible for the new units to take full advantage of the extra air made available by supercharging. The new cylinder heads provide a more direct path from the combustion chamber to the exhaust manifold.

New exhaust manifolds are offered in "dry," "shielded" and "wet" versions to enable users to adapt the engines to their specific needs. The

(Continued on Page 32)

NEW SPRAY PANEL

Spray panel mounted on gear housing demonstrates the sound mechanical approach for spraying lubricant on the pressure side of the gear teeth. The principle shown here is applicable to both the hand-operated and automatically-controlled types of panels.



SUBMERSIBLE PUMPS

Two most popular models of Flygt Pumps. Left, the B-80 pumps 275 GPM's at 20-foot heads. Right, smaller B-38L pumps 55 GPM'S at 20-foot head.

Private and public officials in and around Salt Lake City, Utah recently witnessed a demonstration of Flygt Submersible Contractors Pumps, a series of portable electrically-operated pumping units, manufactured in Sweden and distributed in the United States by Stanco Mfgs. & Sales Inc. of Los Angeles. Attending the demonstration were officials from the construction firm of Gibbons & Reed, Utah Construction Co., Kennecott Copper Co., and public officials from Salt Lake City and surrounding counties.

The demonstration was held on the Jordan River, near Salt Lake City, to show the pump's ability to operate completely submerged in water. Pumping the river water, laden with mud, proved no problem for the pumps. Flygt pumps can handle water containing as much as 40 per cent solids.

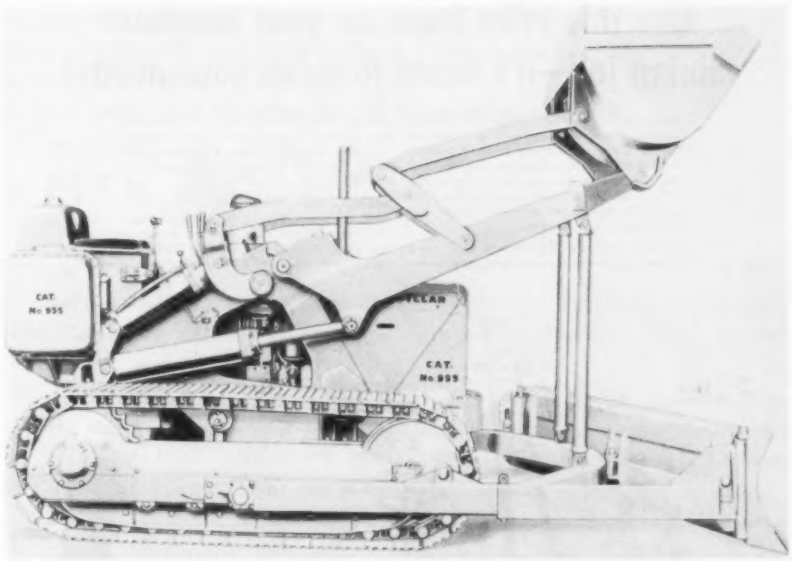
The two most popular sizes of Flygt Pumps, the B-38L and the B-80, were used in the demonstration. The smaller B-38L weighs only 70 pounds, allowing it to be easily carried by one man. This smaller unit can push from 25 GPM's at 60 foot head to 55 GPM'S at 20 foot head. The B-38L can be used singly, with other pumps of the same size, or in connection with the larger models. The B-80 can be transported and positioned by two men, and, with its 6 hp motor, it has a pumping range of from 110 GPM's at 90 feet to 275 GPM's at 20 feet. Both the B-38L and the B-80 are able to handle high heads, and the discharge hoses are a light pressure-type, with no heavy armoured suction hoses required.

Common uses for both the units are pumping sumps on building sites, tunnels, shafts, open excavations, and in dock work. The pumps operate by being dropped into the deepest section of the sump. Water enters through the bottom, and the unit pumps out all the water to the last inch. Self-priming, the pumps automatically begin pumping when water again flows into the sump. They operate submerged for any length of time and require only monthly surfacing for check-ups and any needed servicing.

The 3-phase motor is enclosed in a completely water-tight casing. Type B-38L also can be supplied with a single phase motor. Between the motor and pump is an oil lock and 2 mechanical seals to prevent water from passing into the power unit. The motor is cooled by water passing around the water-tight casing. The pumps are frost-proof and corrosion resistant. They will run efficiently in abrasive material, and, consequently, dry or submerged. In some instances, they have been used for dredging.

END

NEW TRAXCAVATOR



This is a side view of the No. 955 Traxcavator equipped with a new Caterpillar No. 955A angling bulldozer blade. The new bulldozer can be mounted or dismounted in a few minutes, making the machine easily available for either excavating or production bulldozing.

Three new angling blade bulldozers, designed for use with Caterpillar No. 977, No. 955 and No. 933 Traxcavators, have ben announced by Caterpillar Tractor Co.

The new bulldozers have been designated the No. 977A, No. 955A and No. 933A respectively. They have been developed as a part of Caterpillar's continuing program to provide a complete line of attachments for Traxcavators.

With the exception of the No. 933A C-frame group, these bulldozers consist of the same blade and C-frame groups as the No. 6A, No. 4A and No. 2A Bulldozers. Strong links are used to connect the bulldozer C-frame to the Traxcavator lift arms. The same hydraulic controls and cylinders are used for both bucket and blade.

The new bulldozers provide greater versatility for Traxcavators on such jobs as pioneering, road building and backfilling. They are especially useful for backfilling trenches after pipe has been laid and for replacing earth around new foundations.

MINING RESEARCH

(Continued from Page 19)

better visibility would be required, pretty much on the same basis, you can probably drive safely at five miles per hour on a dark night with parking lights, but if you want to go 50 or 60 miles per hour, you had better have sealed beam headlights on the high beam.

The Mining Development Committee's project for mine illumination appears to be successful. Several large companies have budgeted the necessary funds to install these lights in their coal mines, even on present mechanical sections.

From the foregoing it would appear that some work is being conducted on virtually every phase of a complete mining system and if successful, it should bring about a substantial reduction in the cost of producing coal.

Unfortunately, the solution to these problems, even after the basic principles have been evolved require a long time and substantial amounts of money to put into a form to be used in coal mines.

I don't think there is anyone present who would doubt the beneficial effects upon the coal market of $1.00 per ton across the board reduction in

(Continued on Page 35)

Use this Wire Rope on your toughest mining job—it's made to meet your needs!

Wherever you use Wire Rope—for scraper loaders, mine hoists, draglines, strip shovels, on mining machinery—you'll find MONARCH WHYTE STRAND Ropes have the toughness and flexibility to give you longer heavy-duty service at lower cost. These Ropes are designed to serve well under the toughest going—built to fit your needs and service conditions.

MONARCH WHYTE STRAND wire ropes have all the quality features it takes to give you outstanding service. They are supplied PREformed and Internally Lubricated to resist abrasion, corrosion, and internal friction. These Macwhyte Mining Ropes are available in every wire rope classification.

Macwhyte makes a thousand and one types, sizes, and grades of WHYTE STRAND wire rope. This assures a right rope for every mining use and service condition. Use WHYTE STRAND on your toughest jobs—and see for yourself!

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Also headquarters for **JEFFREY** Chains, **DIAMOND** Roller Chains, Sprockets and Flexible Couplings, **JOHNS-MANVILLE, GATKE, RAYBESTOS,** and **VELVETOUCH** Friction Materials.

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NEW ELECTRONIC BRAIN

(Continued from Page 15)

He said a separate division of the company has been established, the Sparton Control Systems Division, and Harold P. Katherman appointed its General Manager, to manufacture, sell, and supervise the installation of the unique modular unit systems.

End

SAFETY

(Continued from Page 25)

ings on a weekly basis.

2. Make the rewards worthwhile to build greater employee enthusiasm.
3. Post contest results or names of drawing winners as soon as possible.
4. Emphasize safety in all activities connected with the contest or drawing.

These three methods or promoting safety are by no means the complete list . . . they represent ideas that other mines can use to advantage. Variations of these ideas and other methods of promoting safety can be adopted easily.

Mine management that has a keen desire to maintain a low accident rate will find plenty of ways to remind the workers and supervisors that **safety is everyone's problem—everyday!**

End

V-TYPE ENGINES

(Continued from Page 30)

new shielded manifolds utilize heavy layers of fiber glass, encased in steel, to keep heat out of the engine room without adding to the cooling load of the engine.

The new D397 and D375 Spark Ignited Engines produce 400 and 267 HP respectively, using low cost natural gas as fuel. Outstanding features are a 10 to 1 compression ratio, a low-tension magneto ignition system and new "deep-domed" pistons. The new ignition system uses a magneto to feed low tension current to high tension transformers located near the spark plugs. This keeps the high tension leads very short for a hot, positive spark.

LOOK... BUY... SAVE...

Recently acquired

- **6 — Joy 20BU Loaders, latest type.**
- **12 — Joy 8SC Shuttle Cars, 24" high.**
- **30 — Joy 8BU Loaders.**
- **3 — Joy 11BU Loaders.**
- **30 — Jeffrey 35L Cutting Machines.**
- **2 — Joy 42E16 Shuttle Cars**
- **3 — Joy 42E13 Shuttle Cars**
- **4 — Joy 32E15 Shuttle Cars**
- **1 Ea. — 200KW, 300KW and 500KW Rotary Converter**
- **1 Ea. — 300KW and 500KW MG Set**

Tremendous stock of new parts and supplies for all types of equipment.

WRITE, WIRE, PHONE

J. T. FISH & COMPANY

Phone 2825 **Logan, W. Va.**

The "deep-domed" pistons used in the new spark-ignited engines are the result of extensive research and engineering. They have been designed to give smooth, efficient combustion over a wide range of operating conditions. Carburetors for the new engines are of the heavy-duty industrial type.

The new spark-ignited engines are expected to find wide application in areas where natural gas is available. Some of the jobs for which they are especially suited are powering pipeline pumps, sewage disposal plants, cotton gins, municipal pumping stations, and stationary irrigation systems.

Considerable attention has been given to making the new D397 and D375 Engines highly compact and easy to install. One example of the way in which this has been done is in the space-saving new lubricating systems with engine-mounted filters which are now standard. Large capacity, externally-filtered lubricating systems will still be available as attachments.

Compact design is also seen in the new Caterpillar self-regulated generators which will be available for the new diesel engines. The new generators are of single bearing design, close coupled to the engine and have top mounted exciters. High efficiency and extreme simplicity of operation are outstanding features of the new electric sets.

Power outputs of the new D397 and D375 Engines and Electric Sets (without radiator fans) are as follows:

	INDUSTRIAL			ELEC. SET	MARINE	
	Max. HP @ 1300 RPM	Inter. HP @ 1300 RPM	Cont. HP @ 1200 RPM	KW @ 1200 RPM	Inter. HP @ 1225 RPM	Cont. HP @ 1225 RPM
D397						
Turbocharged	650	575	500	350	550	500
Roots blown	.....	520	450	315	500	450
Naturally aspirated	.....	415	360	250	.....	.....
Spark ignited	.....	.....	400	.....	.....	.....
D375						
Turbocharged	430	375	325	225	300	300
Roots blown	.....	350	302	200	300	300
Naturally aspirated	.....	275	238	165	265	235
Spark ignited	.....	.....	267	.....	.....	.....

NOT RUNNING FOR PRESIDENT!

The promises we make are not based on politics—you can believe every word:

If you have loaders, cutters, shuttle cars, substations, motors, rails, copper wire, tipples, complete mines, and what not to sell, you can be sure J. T. FISH is ready to buy. No quantity too large or small. We pay fair prices the year 'round, regardless of seasonal fluctuations. Cash on the barrel-head! Write, Wire, or Phone.

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Buy from the largest stock of good mining equipment in America. Includes all types of Joy Cutters, Loaders, Shuttle Cars, Cat Trucks, Belt Conveyors, Chain Conveyors, etc.

JOY EQUIPMENT—Rebuilt

6—Joy 20BU Loaders, latest type.
3—Joy 14BU, low pedestal loaders, 38-J Head Motors.
1—Joy 14BU, 7BE Loader, 10 H. P. head motors.
2—Joy 12BU Loaders, 7E, excellent.
6—Joy 8BU Loaders.
12—Joy 8SC Shuttle Cars, lowest type.
2—Joy 32E9 Shuttle Cars.
2—Joy 32E10 Shuttle Cars.
6—Joy 32E15 Shuttle Cars.
2—Joy 42E16 Shuttle Cars.
3—Joy 42E13 Shuttle Cars.
2—Joy 5SC Shuttle Cars, 250 volt DC.
1—Joy T-1 Standard Cat Truck.
1—Joy T-2-5 Cat Truck, AC.
5—Joy T-2-5 Cat Trucks, 250 volt DC.
1—Joy T-26 Cat Truck with reel.
2—Joy Ladel MTB 30", 25 and 40 H. P., tandem drive, 2000' Belt Conveyors.
4—Joy 11B Cutting Machines, like new.
1—Joy 7B Cutting Machine, excellent.
5—Goodman 660 Loaders on cats. Excellent.
8—Goodman Machines on cats, 31" high. All hydraulic.
3—Goodman 512 Cutting Machines with Bugdusters, like new.
3—Jeffrey 29UC Cutting Machines, cat mounted, perfect.

LOCOMOTIVES

2—Jeffrey 20 ton, type MH-110, 42" and 44" Ga.
4—Jeffrey 13 ton, MH-110, 36", 42" and 44" Ga.
3—Jeffrey 10 ton, type MH-78, 42" and 48" Ga.
4—Jeffrey 8 ton, type MH-100, 42", 44" and 48" Ga.
12—Jeffrey 6 ton, type MH-88, 42", 44" and 48" Ga.
3—Jeffrey 4 ton, type MH-96, 42", 44" and 48" Ga.
3—G. E. 4 ton, type 825 Locomotives, 26" high.
10—G.E. 6 ton, types 801, 803, 821 Locomotives, 42", 44" and 48" Ga.
1—G.E. 8 ton, type 822, Locomotive, 44" Ga.
3—G.E. 10 ton, type 809 Locomotives, 42", 44" and 48" Ga.
1—G.E. 10 ton, 829 Locomotive, 36" Ga.
1—Goodman 4 ton, 8-30 Locomotive, 22" above rail.
8—Goodman type 33, 6 ton, 44" and 48" Ga.
2—Goodman 8 ton, type 32A, 44" and 48" Ga.
3—Westinghouse type 902, 4 ton, 42" and 48" Ga.
2—Westinghouse type 904, 6 ton, 44" and 48" Ga.
2—Westinghouse type 906, 44" and 48" Ga.
2—Westinghouse, type 907, 10 ton, 44" and 48" Ga.
3—Gasoline and Diesel Locomotives, 4 to 10 tons.

TIPPLE EQUIPMENT

1—Cedar Rapids portable super Screening Plants.
1—Portable Belt Conveyor 20', gas driven.
1—Railroad Car Unloading Conveyor, gas driven.
1—Allis Chalmers 5' x 14' Rippflo Vibrator.
1—4' x 10' Robbins Gyrex Vibrator.
1—4' x 14' Vibrator, three deck, low head.
Feeders, Drag Conveyors and Loading Booms.

CUTTING MACHINES

3—Jeffrey 29UC Universal on cats.
4—Baby Goodman 212's, rebuilt.
3—Goodman 312's, 18" high.
3—Goodman 412's, 18" high.
3—Goodman 512's, with Bugdusters, like new.
15—Goodman 12AA's and 112AA's.
10—Goodman 324 Slabbers.
2—Goodman 224 Slabbers.
2—Goodman 724 Slabbers.
3—Jeffrey 35L's, like new, 17" high.
15—Jeffrey 35B's and 35BB's.
2—Jeffrey 29B's on track.
1—Jeffrey 29L, track mounted.
2—Jeffrey 29C's, track mounted.
1—Jeffrey 29U, Universal, track mounted.
1—Sullivan CR-10, 15" high.

LOADING MACHINES

7—Joy Loaders, all types.
2—Jeffrey 61 CLR's on rubber, 26".
3—Jeffrey L-500 Loaders.
2—Goodman 360 Loaders.
4—Myers Whaley No. 3 Automat Loaders.
4—Clarkson Loaders, 26" above rail.

CONVEYORS

4—Joy 30" Belt Conveyors, 10 to 40 H. P.
2—Goodman 97-C's, 26".
15000'—30" Conveyor Belt.
8—Jeffrey 61AM Room Conveyors, 300 ft.
10—Jeffrey 61HG Face Conveyors.
5—Room Conveyors, type 400, 300 ft.
2—61EW Elevating Conveyors.
2—61WH 15" Room Conveyors, 300 ft.
4—Joy Ladel UN-17 Shakers.
10—Goodman G-12½ and G-15 Shakers.

CONVERTERS AND DIESEL PLANTS

3—100 KW, G.E. TCC-6's, 275 volt Rotary Converters.
3—150 KW, G.E. HCC-6's, 275 volt, Rotary Converters.
1—200KW, G.E. HCC-6 Rotary Cenverter, 275 DC.
3—300KW, G.E. HCC-6 Rotary Converters, 275 DC.
1—200KW Westinghouse Rotary Converter, 275 DC.
1—300KW Westinghouse Rotary Converter, 275 DC.
1—500KW Westinghouse Rotary Converter, 275 DC.
(All the above with 6900/13000 and-or 2300/4000 primary transformers)
2—150 KW MG Sets, G.E. and Westinghouse.
2—200KW MG Sets, Westinghouse.
1—200KW MG Set, General Electric.
2—300KW MG Set, General Electric.
2—500KW MG Sets, General Electric.
1—Cummins 125 KW, 250 Volt DC.
1—700 H.P. Shaft Hoist, complete.
Complete steam plant, will sell all or any part. Boilers, like new, 1100 H. P., 500 H. P. Transformers, Turbines, etc. Complete Tipples with Cleaning Plants.

MISCELLANEOUS

10—Air Compressors, 1 H. P. to 40 H. P.
40—Mine Pumps, all types.
Pipe, plastic, steel transit, all sizes 1" to 6".
35—Mine Cars, drop bottom, 42" Ga.
150 Mine Cars, 18" high, end dump, 44" Ga.
300 Mine Cars, end dump, 20" high, 48" Ga.
15—Brown Fayro HKL and HGD Car Spotters.
1—12 ton Differential Slate Larry.
4—Overhead Bridge Cranes.
1—Kanawha Hillside Dump.
5—Low Vein Water Cars.
Incline Hoists, 25 to 50 H.P.
Machine Tools for Mine Shops.
1,000 Tons Rails, all sizes.
2,000 ft. 3/c, 5,000 volt, 2/0 Cable.
10 tons Copper Trolley and Feeder.
300 Transformers from 1 to 2000 KVA, 110 to 13,000 Primary Volts.
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Suspension Bridge, 300' long for river crossings.
1—International TD-24 Angledozer.
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100KW—Diesel M-G Set, GMC Motor, 250V.
8BU Joy Loaders & 11B Cutters.
12BU Joy, in new condition, AC Volts.
2 Goodman 512 Cutters, 250 Volts.
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5 No. 4 Track Frogs for 90# or 100# rail.
20 No. 2 Track Frogs for 40# rail.
600 HP Hoist, Drum rolls 10,000' of 1⅛" rope.
2—Lee-Norse Shuttle Cars, price right.
Fairfield Portable conveyor on rubber, hydraulic.
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Lima 2400 Drag, 110' boom, 5 yd. bu.
Page 621 Drag, 120' boom, 6 yd. bu.
Marion 111M Shovel, 3¾ yd. bucket.
Lima 1201 Combination, 3 yd., high front.
Lorain 80 Shovel, 2 yd., 13000 Cat. Motor.
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"BUY AND TRY" **$10,000.00**

Item 1255-P398—Caterpillar D7 Tractor mounted with LaPlante-Choate Hydraulic Angle Blade. Repaired Bendix and starting engine clutch; cleaned carburetor and installed new spark plugs in starting engine; adjusted steering clutch, master clutch and brakes; replaced steering lever bushings and shaft; installed new carrier rollers, new canopy top, new cutting edge and corner bits; repaired radiator; repaired hydraulic jack; machine has good tracks, rollers, sprockets, and idlers.
F.O.B. Pittsburgh, Pa. **$6,700.00**

Item 655-WV151—Caterpillar D7 Diesel Tractor mounted with LeTourneau Straight Dozer and Rear Double Drum Cable Control. Installed new pre-cleaner; steam cleaned, painted and redecaled complete unit. A good machine for the price.
"BUY AND TRY" **$5,000.00**

Item 455-B146—Caterpillar DC Tractor with LaPlant-Choate Angling Bulldozer. Rebuilt engine including new crankshaft and bearing; repaired left final drive, flywheel clutch, clutch linkage, track roller frame on right side. New hydraulic hoses, end bits and C-frame; tracks were pinned and bushed recently. F.O.B., Bradford, Pa.
"CERTIFIED BUY" **$6,000.00**

Item 356-P429 — Caterpillar Model D4-HT4 Tractor with Electric Starting System and 80" Wide Bucket. Repaired starting system; adjusted steering clutch and mast clutch; installed new cutting edge on bucket; tracks, rollers, sprockets and idlers in fair condition. F.O.B., Pittsburgh, Pa. **$5,500.00**

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MINING RESEARCH

(Continued from Page 32)

the price of coal, presuming present profit margins could be maintained. Some of this increased market would be at the expense of competing fuels. It would certainly be a deterent to the Atomic Energy Power Generation Program. It would certainly be a stimulant to evolving new non-fuel uses of coal and would help substantially in making the production of gasoline from coal economically feasible. It has been said by one authority that the best way of meeting competition is by producing more and more for less and less.

*Presented at Annual Meeting of Bituminous Coal Research, Inc.

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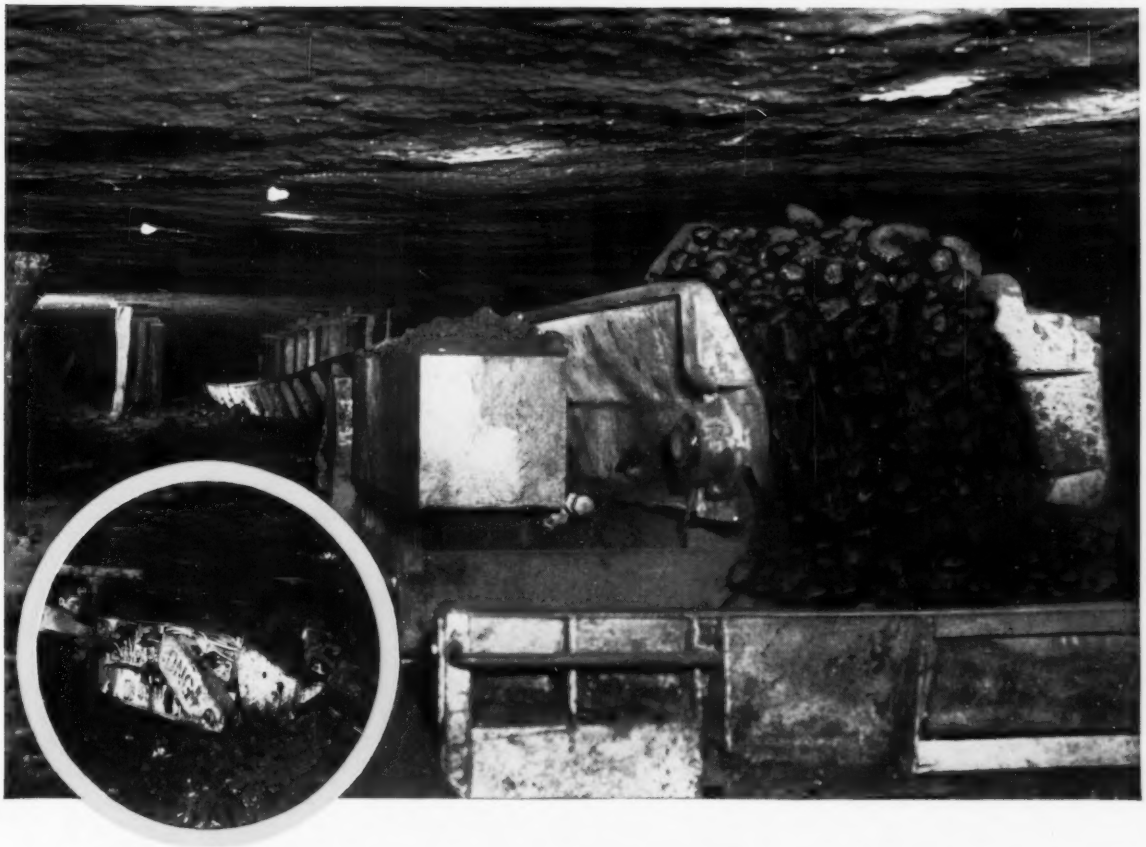

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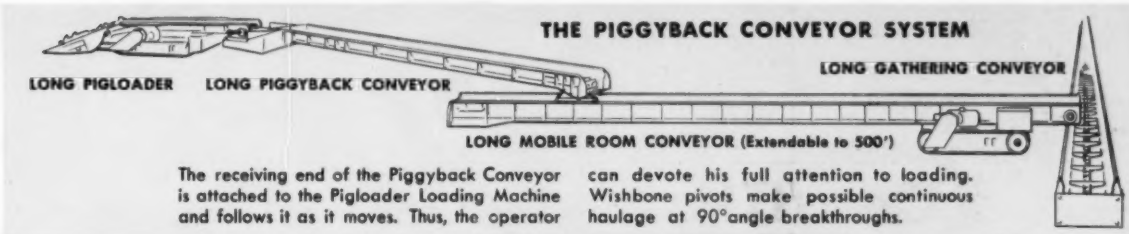

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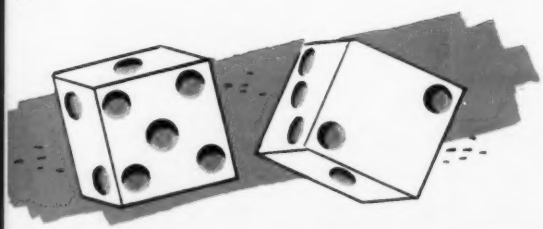

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